HDRI 3D

LIGHTING THE WAY FOR DIGITAL ARTISTS

JANUARY/FEBRUARY 2005

INSIGHTS & TECHNIQUES from Professional Digital Artists

TUTORIALS IN THIS ISSUE:
MAYA · LIGHTWAVE
XSI · PHOTOSHOP

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HDRI 3D

MAGAZINE

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Lighting the way for digital artists

YOU CAN'T PLEASE ALL OF THE PEOPLE ALL OF THE TIME

When I started my company in 1992, I had a lot of plans. I began slowly, part-time, on the side, out of my apartment in Chicago. In 1994, I started working full-time for myself. A couple of years later, we had office space, audio production, and video support. My plans were now bigger. This summer, I celebrated 10 years in business, with some good days, some bad, and I wouldn't have changed a thing. Well, maybe a few things! But through all of it, one thing I have learned is that you can't please all the people, all of the time. And even though I have tried, many times at my own expense, some people just have their minds made up.

Recently, I heard from a good friend about another "colleague" who was badmouthing my books in his own seminars. This isn't the first time I've heard about this happening either. I'm not sure why, and I probably never will be. But I rest easy in the fact that you just can't please all the people all of the time.

Our first issue of HDRI 3D Magazine hit the streets in November 2004. I've heard from so many readers and they are not only happy with the first issue, they are quite surprised. I'm not sure what they thought the magazine would be, but perhaps they underestimated the team at DMG Publishing. Others, however, couldn't say enough bad things about it. The name was bad, the layout, the content, and so on. But I remember, you can't please all the people all of the time.

As we head on into issue #2, I'd like to extend a warm welcome to Dariush Derakhshani and Raffael Dickreuter to the editorial team for our upcoming third issue. They will bring their expertise and skills to the publication, adding to our ever growing content. Their talent might help us please more people. I'd also like to thank all of the hard working people that make this magazine possible every issue, especially Amber Goddard, Brad Carvey, and David Wilkinson. Add to that, our readers. Thank you for your feedback, ideas, and comments on HDRI 3D issue #1. We'll continue to expand our coverage of software and extend our features with every issue. Keep on reading, and we'll keep trying to please.

Dan Ablan

EDITOR-IN-CHIEF

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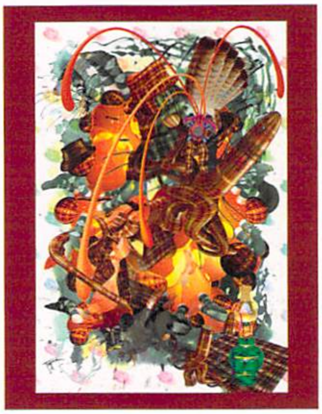
See the article beginning on page 8 to find out how Fine Artist Philip Timper created this month's cover image. Utilizing 3D applications, Photoshop, and an artist's imagination, Philip creates works of fine art that dazzle the senses with whimsy and depth.



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PUBLISHER
Alice M. Edgin alice@dmgpublishing.com

EDITORIAL DIRECTOR/PUBLISHER
Charles A. Edgin charles@dmgpublishing.com

EDITOR-IN-CHIEF
Dan Ablan dan@hdri3d.com

TECHNICAL EDITOR
Brad Carvey bradcarvey@hotmail.com

MANAGING EDITOR
Amber Goddard amberg@hdri3d.com

CONTRIBUTORS
Deuce Bennett deuce@ciamgineering.com
Stephen M. Burns chrome@ucsd.edu
Brad Carvey bradcarvey@hotmail.com
Gregory Glezakos gregory@sub-pixel.com
Eric S. Keller robotball@yahoo.com
Aaron Kent kindofshiftless@yahoo.com
Matt Lind Matt@Mantom.net
Will Mendez wmendez@Softimage.com
Peter Ratner ratnerpj@jmu.edu
Philip Timper timperart@cox.net
William 'Proton' Vaughan Proton@spinquad.com

ART DIRECTOR
David S. Wilkinson david@sabredesign.net

LAYOUT/DESIGN
Sabre Design artists@sabredesign.net

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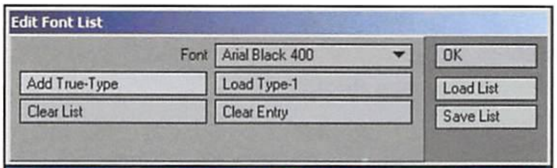
BY BRAD CARVEY

LW ESSENTIALS
3D TEXT

Creating cool looking 3D text is fun and easy with LightWave. There are lots of interesting effects possible with the tools in LightWave. LightWave [8] has some new tools that make the task even easier. In this article, we will use LightWave Text, Bevel, and Extrude tools to create 3D text with extruded edges.



Font: Arial Black 400

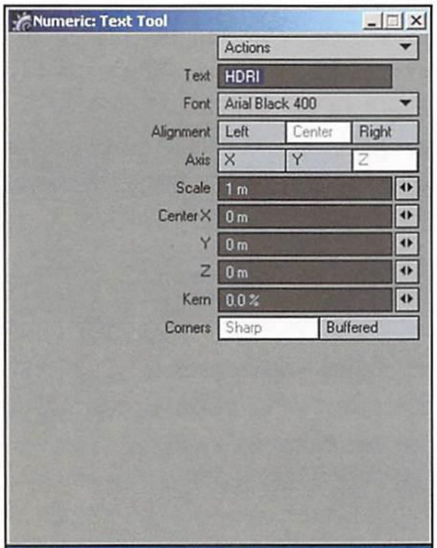
FIGURE 1

ADDING A FONT TO MODELER

1) Open the "Edit Font List" window *[Modeler/Options/Edit Font List]* (for LW 7.5) or the "Manage Font" window (F10) (for LW 8.0). *See Figure 1.*
2) Select "Add True-Type."
3) Select a font. (In this tutorial, "Arial Black" was used.)
4) Click "OK."

CREATE TEXT

5) Activate the "Text" tool (Create/Text, or press Shift + w).
6) Open the Numeric window (n).
7) Type the desired text in the "Text" field. *See Fligure 2.*
8) Close the Numeric window.
9) Commit the text by deactivating (clicking) on the "Text" tool button.

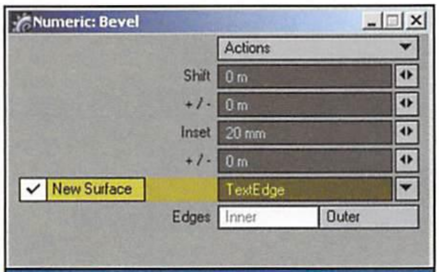


Text: HDRI
Font: Arial Black 400
Alignment: Left / Center / Right
Axis: X / Y / Z
Scale: 1 m
Center X: 0 m
Y: 0 m
Z: 0 m
Kern: 0.0 %
Corners: Sharp / Buffered

FIGURE 2

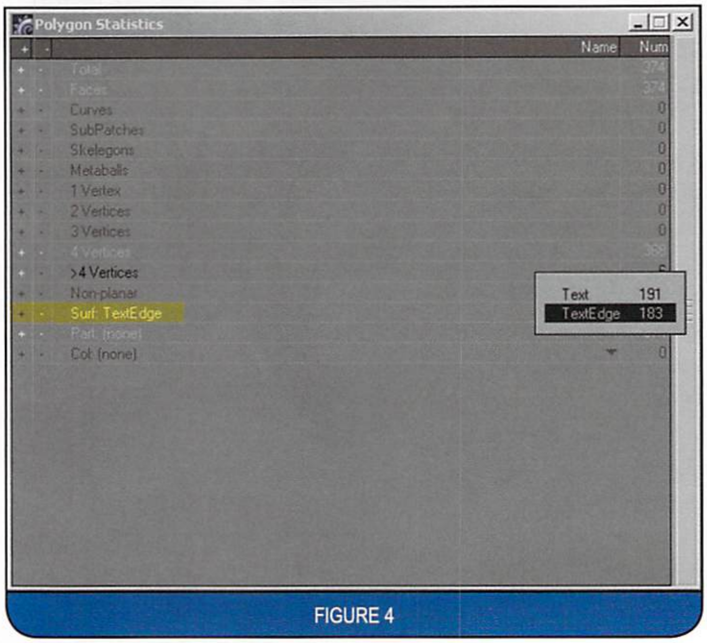
BEVEL AND EXTRUDE TEXT

10) Select Multiply/ Extrude, or press Shift + e).
11) Open the Numeric window (n). Enter a value in the Z "Extent" field. *See Figure 3.* Close the Numeric window.
12) Commit the Extrude by deactivating the "Extrude" tool (click on the "Extrude" button).
13) Select the polygons on the front of the text.
14) Activate the "Bevel" tool (b). Open the Numeric window (n).
15) Set the "Inset" value to 30 mm. Select the "New Surface" check box. Enter a name for the new surface (TextEdge). Close the Numeric window.
16) Deactivate the "Bevel" tool (b) and then deselect the polygons.
17) Open the "Polygon Statistics" window (w).
18) Select the "TextEdge" surface and click on the "+" to select the polygons with the TextEdge surface. *See Figure 4.*
19) Close the "Polygon Selection" window.
20) Activate the "Extrude" tool (E).
21) Open the Numeric window (n), and enter a value 30 mm in the "X Extent" field.
22) Commit the Extrude by clicking on the "Extrude" button.



Shift: 0 m
+/-: 0 m
Inset: 20 mm
+/-: 0 m
☑ New Surface: TextEdge
Edges: Inner / Outer

FIGURE 3



Polygon Statistics

Name	Num
Total	374
Faces	374
Curves	0
SubPatches	0
Skelegons	0
Metaballs	0
1 Vertex	0
2 Vertices	0
3 Vertices	0
4 Vertices	368
>4 Vertices	6
Non-planar	
Surf: TextEdge	
Part: (none)	
Col: (none)	0

Text	191
TextEdge	183

FIGURE 4

23) The extruded polygons will be inside/out. To fix them, first open the "Polygon Statistics" window (w). Select the polygons with the "TextEdge" surface. Then, Flip the polygons (f).

ASSIGN SURFACE COLORS

24) Select the polygons that make up the SIDES of the text (NOT "TextEdge," the front, or the back).
25) Open the "Change Surface" window (q). Type in the desired name (TextSides). Click on "Smoothing," then "OK." Deselect polygons.
26) Open the "Polygon Statistics" window (W), Select "TextEdges," and "TextSides" polygons.
27) Select inverted polygons (click "Display/Sel Invert" or (")).
28) Open the "Change Surface" window (q). Type in the desired name (TextFace), then "OK". Deselect polygons.
29) Open the Surface Editor (Ctrl + F3).
30) Select the "TextSides" Surface.
31) Under the "Basic" tab, locate "Smooth Threshold," and change the value to about 50°. This will smooth the rounded edges, but keep the flat surfaces flat.
32) Select the "TextEdge" Surface, and change the "Smoothing Threshold" value to about 50°, as well.
33) Adjust all the surfaces as desired.

To create the final image, I used the radiosity dome discussed in a previous LightWave Essentials article and added one area light. I also adjusted the surface attributes for red and yellow areas. *See Figure 5.*

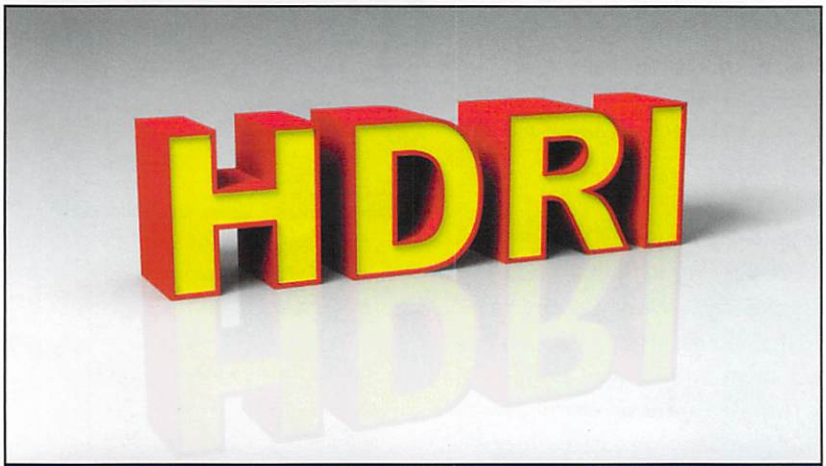


FIGURE 5

BRAD CARVEY HAS BEEN DOING COMPUTER ANIMATIONS FOR A LONG TIME. IN 1969, BRAD USED AN ANALOG COMPUTER, WHICH WAS THE SIZE OF A CAR, TO PRODUCE HIS FIRST COMPUTER ANIMATION. BRAD IS AN ELECTRICAL ENGINEER AND AN EMMY AWARD-WINNING MEMBER OF THE VIDEO TOASTER DEVELOPMENT TEAM. HE PREFERS TO DO FEATURE FILM WORK. HIS CREDITS INCLUDE FILMS LIKE *MEN IN BLACK*, *STUART LITTLE*, *BLACK HAWK DOWN*, *KATE & LEOPOLD* AND *MASTER OF DISGUISE*.

BY PHILLIP TIMPER

Fedoras 'n' Argyle

CREATING THE ARTWORK ON THE COVER OF THIS ISSUE

The artwork I create presents an arrangement of elements that express emotions and feelings. The elements are vaguely representational symbols from that place between the dream state and psychosis. By scanning natural media and integrating the scans with digital painting, drawing and 3D, I work with heart and mind devoted to the final image.

This piece, called "Fedoras 'n' Argyle" (Cover art), relied on Carrara 3, Adobe PhotoShop 7, Illustrator 10, a bit of photography, a scanned watercolor and Painter 8. There are some elements that combine a texture map and vectors that Carrara was able to bring to life. Carrara's spline modeling room gave me the flexibility to experiment with radical shapes and the precision to model specific forms.

In this piece I did just that; I used Carrara's modeling capabilities to build fantastically wild shapes using utterly hairball sweep paths to convolute what was basically a warped hot dog spline object *(Figure A & 1A)*. Just a bit later in the process, I was able to use the same modeling room to build handsomely blocked fedoras and a beautifully rendered glass oil lamp *(Figures B & C)*.

I wanted the shapes to have a "bad plaid" texture *(Figure D)*. The kind of plaid worn by those old farts you see at the mall – you know the ones, wearing white shoes and belt, black knee-high socks, three different plaids – one for the baggy shorts, one for a too tight shirt, and of course another for a dashing fedora. (Hey good lookin'!)

I used Carrara's texture room to map the same texture onto a variety of shapes with the same tile-able "bad plaid" JPEG.

I made my own plaid tile in PhotoShop 7. It is a file with 23 layers, with most layers set to Hard Light mode, some set to Multiply, others set to different opacities. Each layer was nothing more than a few rectangles filled with different earth tones. By changing layer settings and stacking order, I was astonished at the multitude of variations I was able to come up with. (I could have made a new plaid for every Scottish clan on the moor.) For the final touch, in PhotoShop I chose a texture *(Filter > Texture > Texturizer > Canvas)* for the cloth plaid map that gave the final rendered forms that look of an exquisitely cheesy trailer-trash couch – ahh, perfection!

By mapping the same JPEG onto the different elements in the piece, I was able to establish repetition. The repetition of the plaid texture was counterbalanced by the free flowing watercolor background. The background colors were echoed in the repeating argyles. I used Illustrator to generate the small fedora repeat background using the Shape Blend tool. My ultimate goal was an effect of a jumbled and frantic array. The complexity of like patterns would challenge the viewer's natural tendency to try to piece together a cohesive image. Of course, the viewer never would, but would be subject to eye flow and the less obvious interplay of recognizable objects.

One of the design principles I like to work with is establishing symmetry and "breaking" symmetry. With Carrara's Metaball modeler, I built organic shapes and combined them with simple primitive spheres *(Figure E)*. These elements I arranged in PhotoShop to create the quasi-asymmetrical foundation *(Figure F)* for the fedoras and argyle shapes to be hidden and discovered.

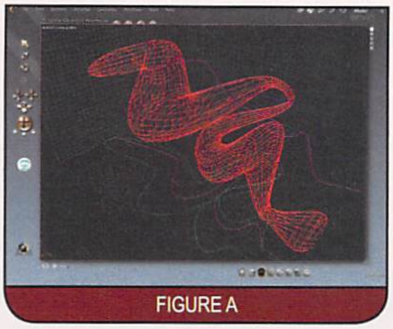


FIGURE A

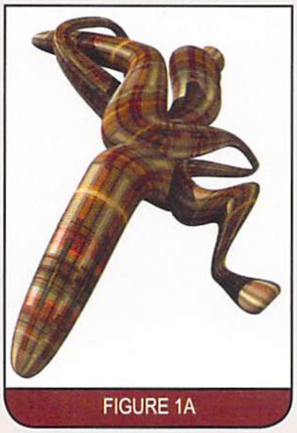


FIGURE 1A

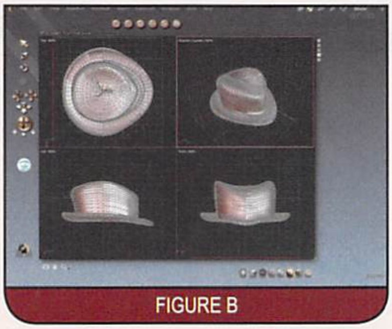


FIGURE B

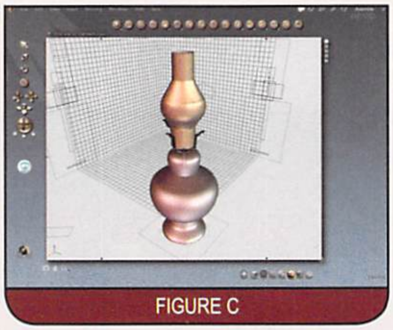


FIGURE C

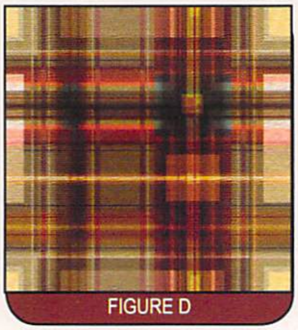


FIGURE D

Orchestrating all of the various 3D shapes, vector shapes, textures, and watercolor in Photoshop is where I enjoy overlapping, interweaving, hiding / revealing the elements to make the composition. As you might guess, I like a kind of "chutes & ladders" eye flow in my work – my intention is for the viewer to have fun zipping up, down, around, and through my art, stopping to snack on visual munchies along the way. If afterwards their senses are reeling from an aftertaste combining three-month old butterscotch candy (that was stuck between the cheesy couch cushions) and nicotine-stained polyester, I have succeeded.

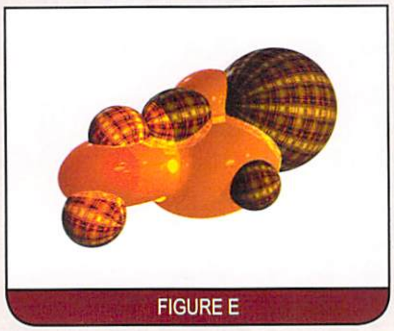


FIGURE E

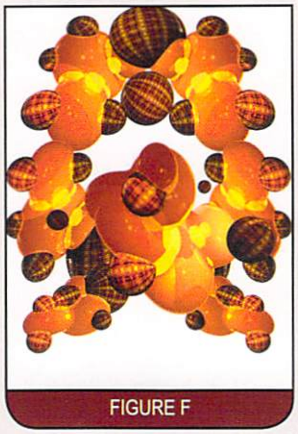


FIGURE F

PHILIP TIMPER BEGAN TO OIL PAINT AND STUDY COLOR THEORY WITH JUNE KELLY IN 1963 AT THE AGE OF NINE, AND CONTINUED TO WORK UNDER JUNE KELLY UNTIL 1971. HE PRACTICALLY LIVED IN THE ART DEPARTMENT DURING HIGH SCHOOL. SOMEHOW, HE GRADUATED AND STUDIED FINE ART AT SOUTHERN ILLINOIS UNIVERSITY AT EDWARDSVILLE AND RECEIVED A BACHELOR'S DEGREE IN FINE ART IN 1980. TIMPER DREW CARICATURES AND DID NEWSPAPER ILLUSTRATION AND PAINTED MURALS AS PART TIME WORK DURING THOSE YEARS. LATER, HE FOUND HIMSELF IN THE COMMERCIAL ART WORLD AND BECAME THE "GO-TO GUY" FOR CREATIVE SOLUTIONS FOR PRODUCT DEVELOPMENT AND PROMOTIONS AT VARIOUS COMPANIES. TODAY HE AND HIS WIFE RUN THEIR OWN SUCCESSFUL DESIGN BUSINESS IN SOUTHERN CALIFORNIA (WWW.TIMPERARTS.COM).

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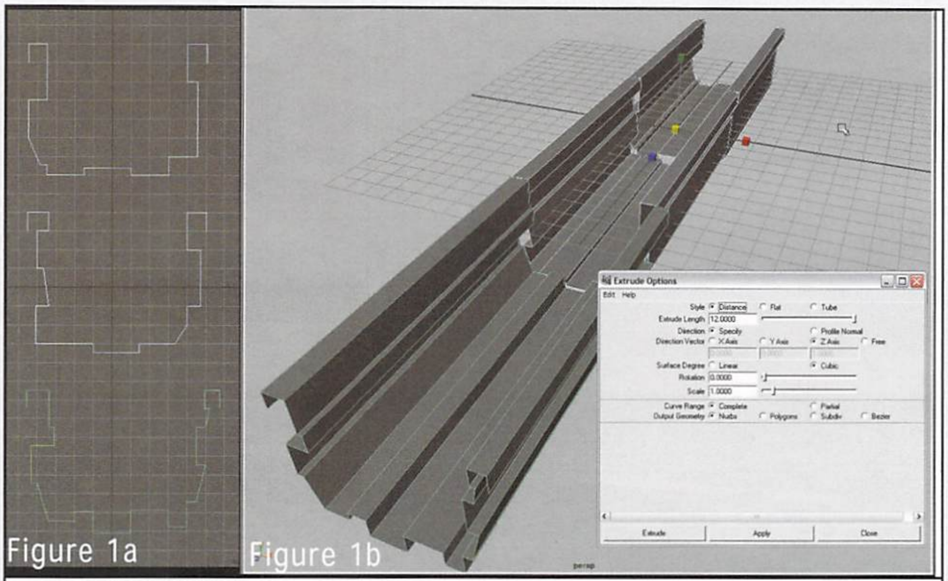
BY ERIC S. KELLER

RETRO-FUTURISTIC COMPUTER DISPLAYS WITH MAYA'S PAINT EFFECTS

It's a bit of cliché for special effects artists to say how influential the movie *Star Wars* has been on their life and work. But far be it for me to let a good cliché die! Therefore, I must say, *Star Wars* has been a huge influence on my life and work. Growing up in Montreal, my brothers and I would take the bus into town from Nun's Island, use our paper route money to get in to a matinee, and then hide under the seats between showings so that we could watch the movie over and over again.

So it happens that *Star Wars* (AKA *Episode IV: A New Hope* for the nerds out there) is the inspiration for this tutorial. I've always loved the style of the computer interfaces in the series and it occurred to me that it wouldn't be too difficult to create something similar using Maya's Paint Effects module. Specifically, I thought of the briefing scene before the rebel pilots' attack on the first Death Star. That scene includes an animation on a computer screen showing the rebel pilots the path they'll have to take down the infamous trench towards the exhaust port. This tutorial will show you how to create something similar, which you can then use for computer displays in the scenes you create.

The primary tools I used are NURBS curves, simple polygon geometry, and the neon brushes found in the glows folder in Maya's Paint Effects module. If you've never used Paint Effects before, this tutorial will give you some ideas on applications that go beyond just painting grass, trees, and hair into a scene. The neon brushes in the Paint Effects module have become an addiction of mine. They are very simple, easy to use, and versatile for creating these types of futuristic computer screen effects. Here's how I created my homage to the *Star Wars* computer display.



Style ● Distance ○ Flat ○ Tube
Extrude Length 12.0000
Direction ● Specify ○ Profile Normal
Direction Vector ○ X Axis ○ Y Axis ● Z Axis ○ Free
Surface Degree ○ Linear ● Cubic
Rotation 0.0000
Scale 1.0000
Curve Range ● Complete ○ Partial
Output Geometry ● Nurbs ○ Polygons ○ Subdiv ○ Bezier

FIGURE 1A SHOWS THE THREE PROFILES THAT WILL BE USED TO EXTRUDE THE TRENCH GEOMETRY. FIGURE 1B SHOWS THE EXTRUDED TRENCH AND SETTINGS

PART 1 - CREATING THE TRENCH

1 I created three profile curves using the CV Curve Tool. In the CV Curve Tool option box, I set the curves to Linear rather than Cubic so they would have nice sharp angles. It's easiest to do this in an orthographic view with Grid Snapping engaged. I made sure the curves were the same height and about the same width. Once they looked pretty good, I turned off Grid Snapping and moved the CVs around a little more. *See figure 1a.*

2 I spaced these profiles evenly and then extruded them. In the options for Extrude, I chose Distance and extruded each of them about 12 units in Z. *See figure 1b.*

3 I deleted history on these NURBS surfaces and then tightened their spacing a little. It doesn't need to be terribly precise.

4 To create the detail that will actually define the trench on the computer display, I created a number of simple shapes and circles using more linear CV curves. I drew these in the top view camera and

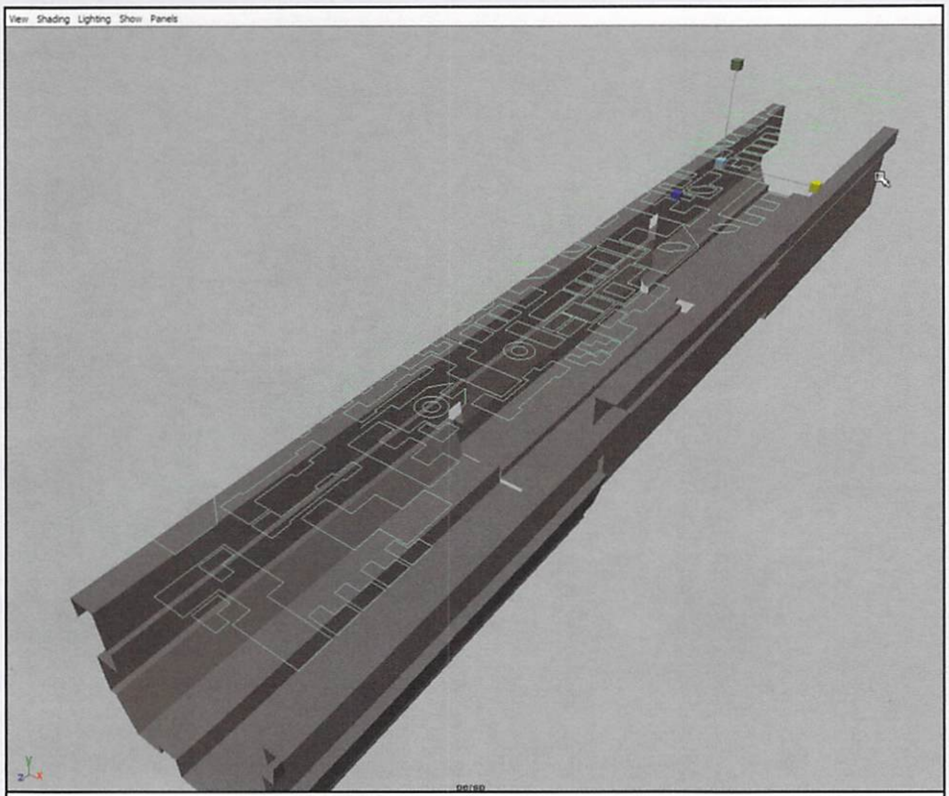


FIGURE 2– A PATTERN OF SIMPLE SHAPES MADE FROM NURBS CURVES ARE PLACED ABOVE THE TRENCH GEOMETRY IN PREPARATION FOR CURVE PROJECTION

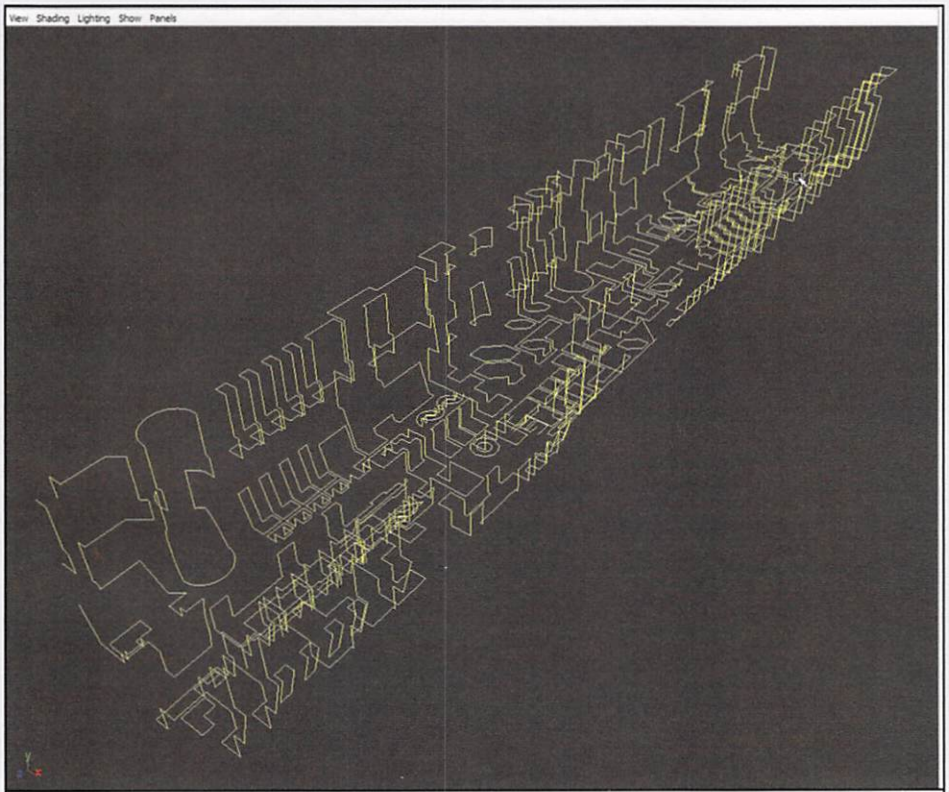


FIGURE 3– THE RESULT OF PROJECTING THE CURVES ONTO THE GEOMETRY. THE CURVES ON SURFACE HAVE BEEN DUPLICATED AND THE TRENCH GEOMETRY HAS NEEN HIDDEN

translated them in Y so that they were above the trench. In many cases, I just duplicated a shape several times and then translated, rotated, and scaled it to fill out the pattern of shapes quickly. Generally, I try and keep the shapes simple so that the final detail doesn't become overwhelming. *See figure 2.*

5 I selected the curves and the NURBS trench geometry and projected the curves onto the geometry from above. The quickest way to do this is to group all of the curves, move them above the NURBS trench, select the grouped curves and then all three NURBS trench surfaces, and choose *Edit NURBS>Project Curve on Surface.* I find that the default settings work well enough. In this case, I wanted to project down onto the trench geometry, so I switched to the top view and selected "Project along Active View" in the option box for "Project Curve on Surface."

6 It takes a few seconds, but the curves on surface will appear projected on the geometry. I wanted to duplicate these new projected curves so that I could hide the geometry and then apply my Paint Effects brush to the curves. To do this, I turned geometry off in the Selection Mask menu, made sure the Curve Selection mask was on, and then marquee selected around all the geometry, which then selects just the curves on surface.

7 I duplicated these curves using *Edit Curves>Duplicate Surface Curves.* With these curves selected, I deleted their history to make the scene a little speedier. This is not an absolutely necessary step, and sometimes I leave history on if I decide I want to animate these curves by deforming or animating the original NURBS geometry.

8 To neaten things up a bit, I put the original NURBS geometry on its own display layer and then grouped the new curves and put them on their own display layer. Turning the NURBS geometry layer off will show how the wireframe trench will look. *See figure 3.* I also deleted the original detail curves I used for the projection above the trench.

9 At this point, the trench looks pretty cool, but it could use a few improvements before attaching the Paint Effects strokes. I used the EP curve to close up some of the gaps in the projected wireframe and Curve Snapping to help place the ends of the EP curves on the curves of the wireframe trench. I also added some detail by placing a few NURBS circles on the walls of the trench.

10 The next step is to apply a Paint Effects stroke to these curves. I do this by opening up the visor to the Paint Effects brushes folder, selecting the blue neon brush from the glows subfolder, and templating its settings. In the Rendering menu set, there is a menu for Paint Effects. I select the command "Template Brush Settings."

11 I selected all the curves that made up my wireframe trench in the outliner and chose (under the Rendering menu set) *Paint Effects>Curve Utilities>Attach Brush to Curves.* You may notice, at this point, that I have not switched from the perspective window into the Paint Effects panel. I rarely do when I'm creating this kind of effect. It slows things down and it's not really necessary; I do pretty much everything in the perspective and orthographic displays.

12 Once the strokes are created, I select them in the outliner and choose *Paint Effects>Share One Brush.* This way I can make adjustments to one stroke and the rest will update accordingly. I usually hide the strokes in my modeling view to keep things working quickly (in the Panel View options, uncheck Strokes from the Show menu). They will still render even though they are not being displayed.

13 Before I began adjusting the brush settings, I created a camera that would give me an idea of what the final render would look like. I put this camera at one end of the trench and create some keyframes so that it will move to the other end of the trench over the course of 300 frames or so. To increase the dramatic effect of the animation, I decreased the focal length of the camera to about 10. Take a look at *figure 4* to see how the rendered Paint Effects trench looks at this point. I'm rendering with Maya's software rendering engine, not mental ray. Mental ray requires a plugin to render Paint Effects strokes (you can find one by doing a search on the Internet).

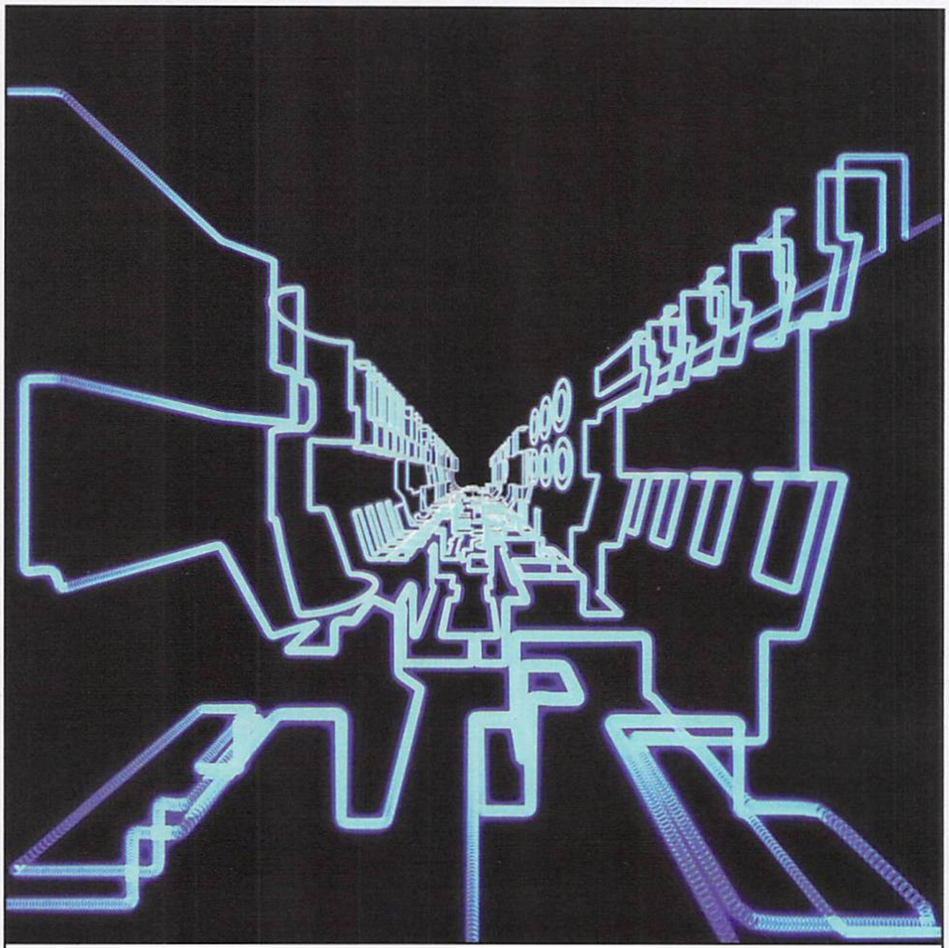


FIGURE 4– THE BLUE NEON GLOW BRUSH HAS BEEN ATTACHED TO THE CURVES THAT MAKE UP THE TRENCH. THIS IS A RENDER FROM A CAMERA PLACED IN THE TRENCH

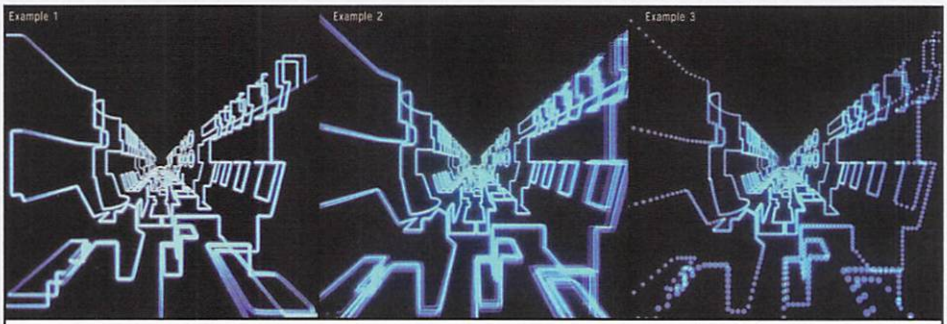


FIGURE 5– THREE EXAMPLES OF THE TRENCH RENDERED WITH DIFFERENT SETTINGS APPLIED TO THE BLUE NEON GLOW BRUSH ATTRIBUTES

14 I select one of the strokes in the outliner and open up its Attribute Editor so I can start playing with the brush settings. These settings are found under the tab labeled "neonBlueXXX," where XXX is the number of the stroke. If Brush Sharing is on, this number will be the same for all the strokes that make up the trench. Brush Sharing is very handy when you have several hundred strokes in a scene that all share the same settings. The Global Scale of the brush is usually the first thing I play with. In this case, it was already close to what I wanted. Some additional

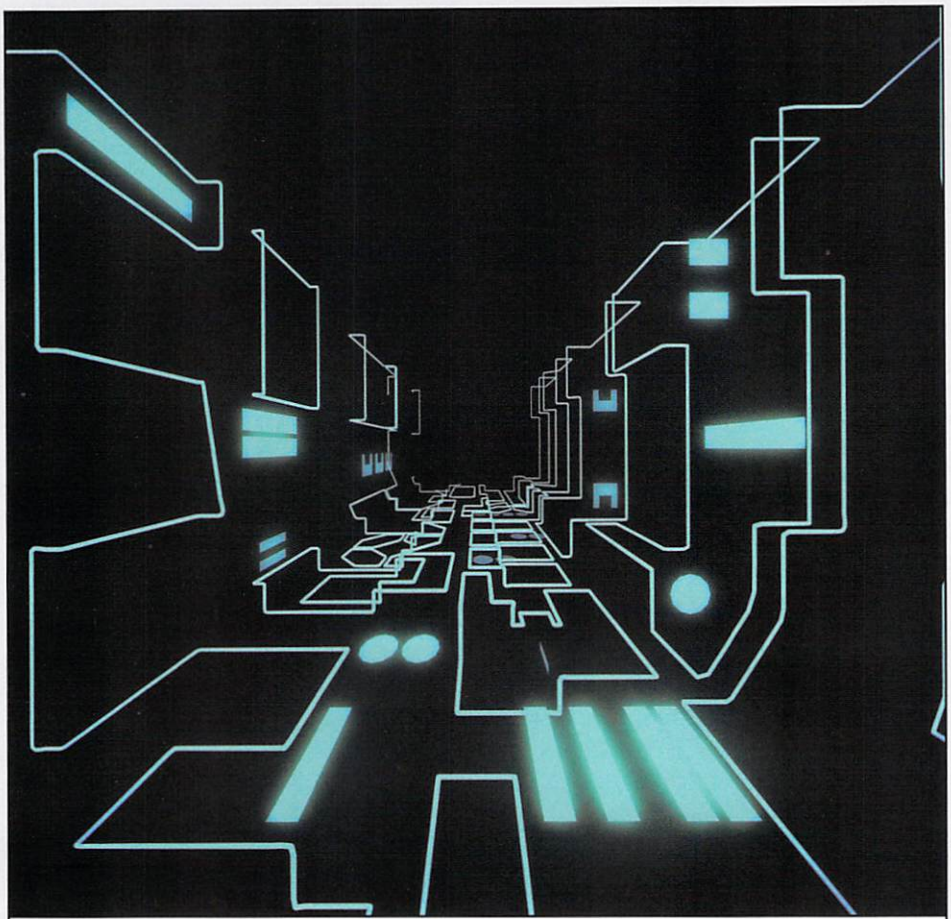


FIGURE 6– SIMPLE POLYGON SHAPES HAVE BEEN ADDED AND RENDERED WITH A LIGHT BLUE SURFACE SHADER. A BIG BLACK CUBE HAS BEEN ADDED TO SHORTEN THE LENGTH OF THE TRENCH. IT HAS BEEN POINT-CONSTRAINED IN Z TO THE CAMERA SO THAT THE TRENCH WILL APPEAR TO BUILD ITSELF AS THE CAMERA MOVES ALONG

parameters I play with are the Brush Width, Color, Incandescence Color, Transparency, Brush Density, Gap Spacing and Gap Random. There is no reason why you couldn't play with all the other settings as well, but for the look I'm going for, these seem to work the best. Learning what a brush can do in Paint Effects involves playing with its settings to see what happens. It's easier to demonstrate than to describe, so look at *figure 5* to see various renders and their settings:

EXAMPLE 1 -

Brush type = Paint
Global Scale = 2.224
Brush Width = .025
Stamp Density = 20
Shading Color1 is a dark blue
Incandescence1 is navy blue
Glow = .174
Glow Color is a light blue
Glow Spread = 2
Shader Glow = .05

EXAMPLE 2 -

Brush type = ThinLine
Global Scale = 2
Brush Width = .015
Multi Streaks = 12
Multi Streak Spread1 = .18
Color1 is a dark blue
Incandescence is a navy blue
Glow = .132
Glow Color is a light blue
Glow Spread = .05
Shader Glow = .05

EXAMPLE 3 -

Brush Type = Paint
Global Scale = 2
Brush Width = .045
Stamp Density = 20
Shading Color1 is a dark blue
Incandescence1 is a navy blue
Glow = .132
Glow Color is a light blue
Glow Spread = .05
Shader Glow = .025
Gap Size = .934
Gap Spacing = .5
Gap Rand = 1

15 The basic trench at this point is almost there, but after checking it out a few times from the animated camera view, I decided it could use some more detail and a little more excitement. I wanted to have the fictional computer display animation build the trench as the camera flies through. To accomplish this effect, I made a large polygon cube, attached a black surface shader to it, and then set the shader's Matte Opacity to zero. The Matte Opacity at zero (or black) ensures that the cube will not show up in the alpha channel of the rendered images if I decide to composite the animation.

16 I animated the cube moving along the trench at the same rate as the camera by point-constraining the cube to the camera on the Z-axis only and then setting a Z offset of -20. I could have parented the cube to the camera and then just moved it back in Z, but I may want to add additional X and Y translations to the camera further on down the road and I don't want the cube moving up and down, or side to side.

17 Next, I added some simple polygon shapes and placed them along the trench. I assigned a surface shader to all of these objects and gave the shader a light blue color, a slight blue glow, and a little transparency. *See figure 6.*

Now this trench looks a bit more respectable. In a still frame it just looks shorter, but when it's animated, the trench appears to be constructed as the camera moves down it.

PART 2 - ADDING AN ENEMY SPACESHIP AND TARGETING INTERFACE

For the next part of this tutorial, I decided to take this beyond the original concept of a simple fly-through animation and make it more suitable for a computer-targeting interface. To do this, I added an enemy spaceship for targeting and the interface elements. The next section will show how I made the computer display version of the enemy ship.

1 I created the spaceship using techniques similar to the ones I used for the trench. First I modeled a very simple NURBS ship. I created a profile curve and then did a Revolve and sculpted from there. It doesn't have to be very detailed, just somewhat spaceship-like.

2 I created some NURBS circles and projected them onto the surface (like I did with the trench). Unlike the trench, I projected from the side instead of the top. *See figure 7.*

3 Once I duplicated the surface curves, I deleted the history on them, grouped them, and centered the pivot point of the group.

4 Once again I opened the visor. This time, I chose the orange neon glow brush and templated its brush settings.

5 I selected all the curves that make up the spaceship and attached the brush to them *(Paint Effects>Curve Utilities>Attach Brush to Curves).*

6 I selected all these new strokes and chose *Paint Effects>Share Brush.* Then I grouped them.

7 The next step is to animate the spaceship. Animating the group of spaceship curves will work just fine, as these spaceship strokes will follow to their curves.

8 Then I created a path for the ship to follow. I drew a curve in the side view, moved the CVs around, and attached the spaceship curves to the path curve using *Animate>MotionPaths>Attach to Motion Path.* I made the ship follow the curve, gave it some banking, and adjusted the time frame for the path so that it is just ahead of the camera.

9 Next, I deleted the keys on the camera, duplicated the curve the spaceship is attached to, moved its CVs around a little to make it slightly different from the spaceship curve, and attached the camera to this new curve so that the camera is just behind the ship. Looking through the camera now as it flies down the trench with its banking and small focal length should make you a little seasick. That's cool. The giant black cube I made still follows the camera, but only its Z translation because of the way I set up the point constraint. The cube doesn't go up or down or side to side as the camera moves along the curve.

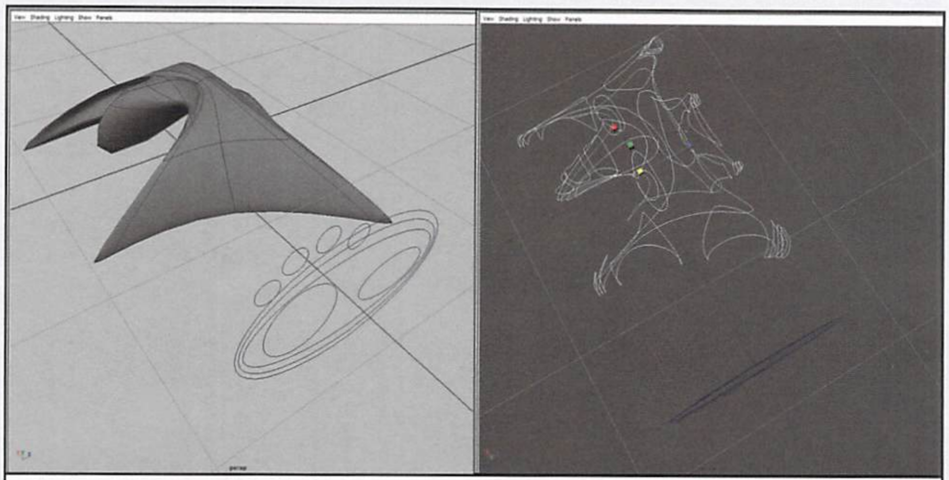


FIGURE 7– A SIMPLE NURBS SPACESHIP WITH CURVES PROJECTED ON FROM THE SIDE

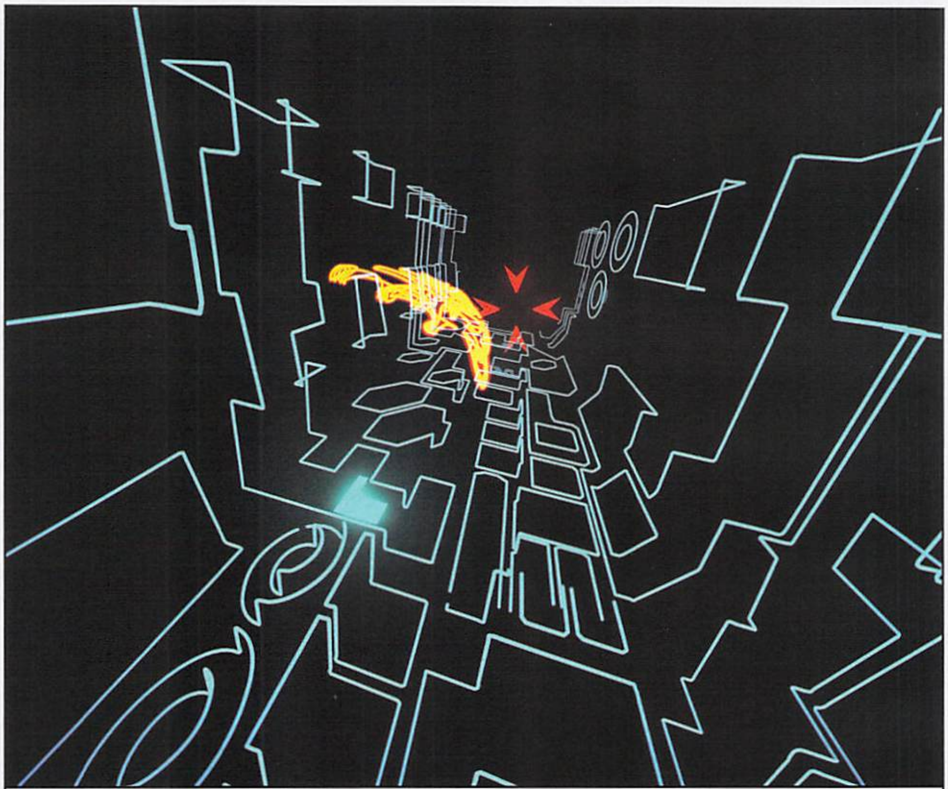
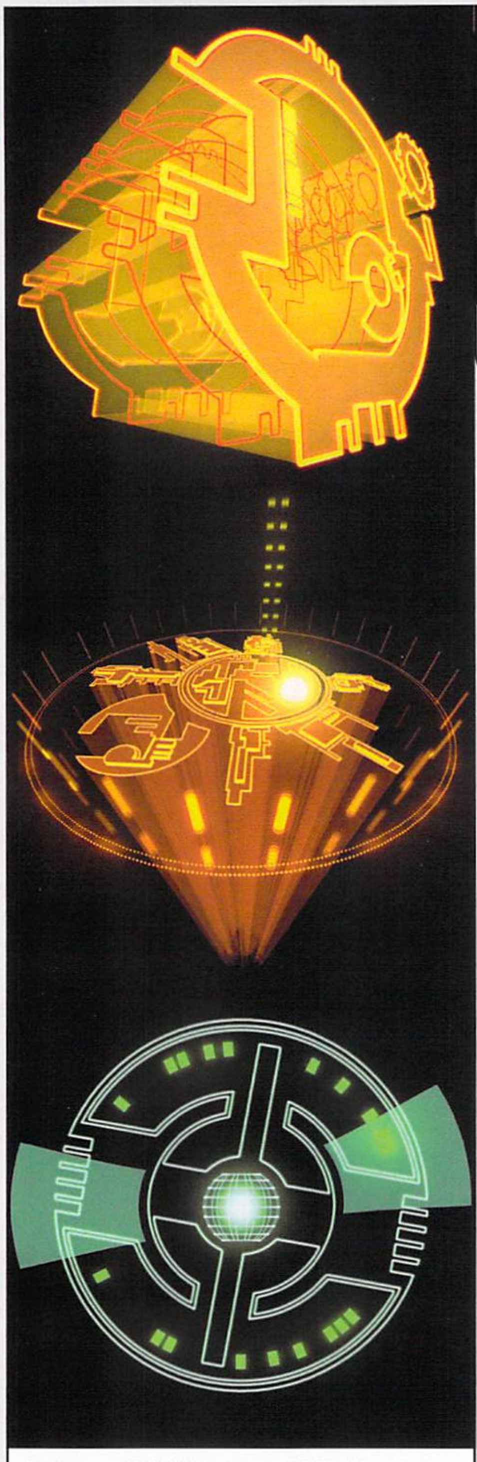


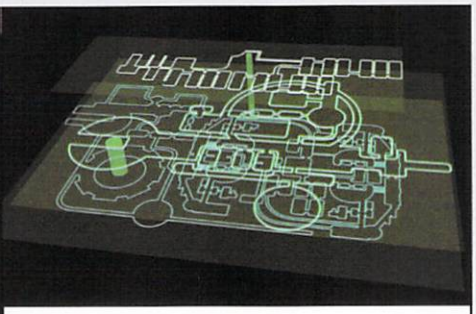
FIGURE 7– THE FINAL TRENCH DISPLAY WITH SPACESHIP AND TARGETING RETICLE

The last details I added to the scene are some targeting computer interface elements.

10 The image is in danger of getting too busy, so I decided to keep the interface elements simple. I created a triangular polygon object from a simple polygon plane, duplicated it three times, and arranged the results to look like a targeting reticle.



SIMILAR TECHNIQUES WERE USED TO CREATE THESE MORE ABSTRACT PIECES OF SCI-FI IMAGERY. THE PROFILE CURVES WERE CREATED IN ILLUSTRATOR AND IMPORTED INTO MAYA



THESE TECHNIQUES ARE IDEAL FOR CREATING 3D MAP DISPLAYS AS WELL

11 I grouped these polygons together and then centered the group's pivot point.

12 Again I point constrained the reticle group, but only in Z. I gave the constraint node an offset of -2.5.

13 I also placed an orient constraint on the reticle group to the camera so that it would constantly face the camera lens.

14 I added some keyframes on the reticle in X and Y to make it look as if the pilot/targeting computer is trying to hit the spaceship.

15 The final scene is shown in *figure 8.* More details can be added using similar techniques, of course, but you have to be careful not to clutter it up too much. The scene can be rendered out as a file sequence, which can then be mapped to the incandescence of a shader applied to a computer screen or even a heads-up display on the visor of a pilot's helmet.

So there you have it, a simple retro-futuristic targeting computer. These techniques can easily be applied to a wide range of computer screen effects. I've included some examples of images to demonstrate some other ways I've used these techniques.

HERE ARE A FEW EXTRA TIPS:

- You can try setting keyframes on the Min and Max Clip attributes found under the "End Bounds" settings in the attributes for the stroke shape nodes. This will create the effect of the neon brushes drawing on the screen over time. This setting is not covered by the "Share Brush" command, so you'll have to adjust for each stroke in the scene.

- More than one brush can be applied to a curve, so you can layer this effect. Try applying a thin neon brush to a curve and then a thicker neon brush with large gaps to the same curve for some interesting effects.

- You may want to draw your curves in a 2D program such as Illustrator or Photoshop and then import them into the Maya scene as EPS files.

- Try applying a non-linear deformer, like bend or sine wave, to the trench curve group to get some other cool designs.

ERIC S. KELLER HAS SPENT THE LAST SIX YEARS AS A SCIENTIFIC ANIMATOR AT THE HOWARD HUGHES MEDICAL INSTITUTE IN CHEVY CHASE, MARYLAND. WHEN HE'S NOT RENDERING MOLECULAR DATA AT WORK, HE ENJOYS CREATING CHARACTER ANIMATION AT HOME IN WASHINGTON, DC. HIS TRAINING IS IN MUSIC AND ART. HIS PRIMARY TOOLS ARE MAYA, ZBRUSH, PHOTOSHOP, AND AFTER EFFECTS, INSPIRATION COMES FROM HIS WIFE ZOE, THEIR TWO DOGS, AND WAY TOO MUCH TV.

BY MATT LIND

AN ALTERNATIVE TO SHAPE ANIMATION

While working in production on projects, as well as lurking in various XSI user forums, one gripe I continually come in contact with is the problems and limitations of shape animation workflow for creating deformations for use in lip sync, cartoon animation, and anything requiring an organic look. However, despite the problems, many users insist on continuing the use of shape animation, believing it's the only real option. Personally, I've never liked shape or cluster animation workflow due to its closed and laborious nature, so today I'd like to offer an alternative for those who are also tired of using shape animation.

Shape animation, in XSI, is a method of animating a surface's shape directly by manipulating its points, then saving a snapshot of the surface as a shape key. The shape key is then blended with other shape keys of the same surface at different moments in time to provide the illusion of a deforming surface. Generally speaking, the in-betweening process works by interpolating the positions of all the points of the surface from one shape key to the next in linear fashion. That is, pick a point on the surface, and then draw a line connecting its current position to its position on the next shape key. The point will be moved along that imaginary line from the first shape key en route to the second shape key over the specified number of frames. The stored positions of the points in the shape key are relative to the object's center.

Shapes are often used when an organic feel is needed, such as animating faces for lip sync, creating muscle bulges on character limbs, or mocking up quick simulations of liquids that don't need to be particularly accurate. Many tools and 3rd party plugins utilize shape animation as the preferred workflow to handle deformations such as the cloth simulations and some file import/export tools. The shape workflow is often the first choice for its simplicity of setup and use. There is also a plethora of mixing and blending options for shapes that allow additional new shapes to be generated from existing shape keys, which can help to add exaggerations when needed.

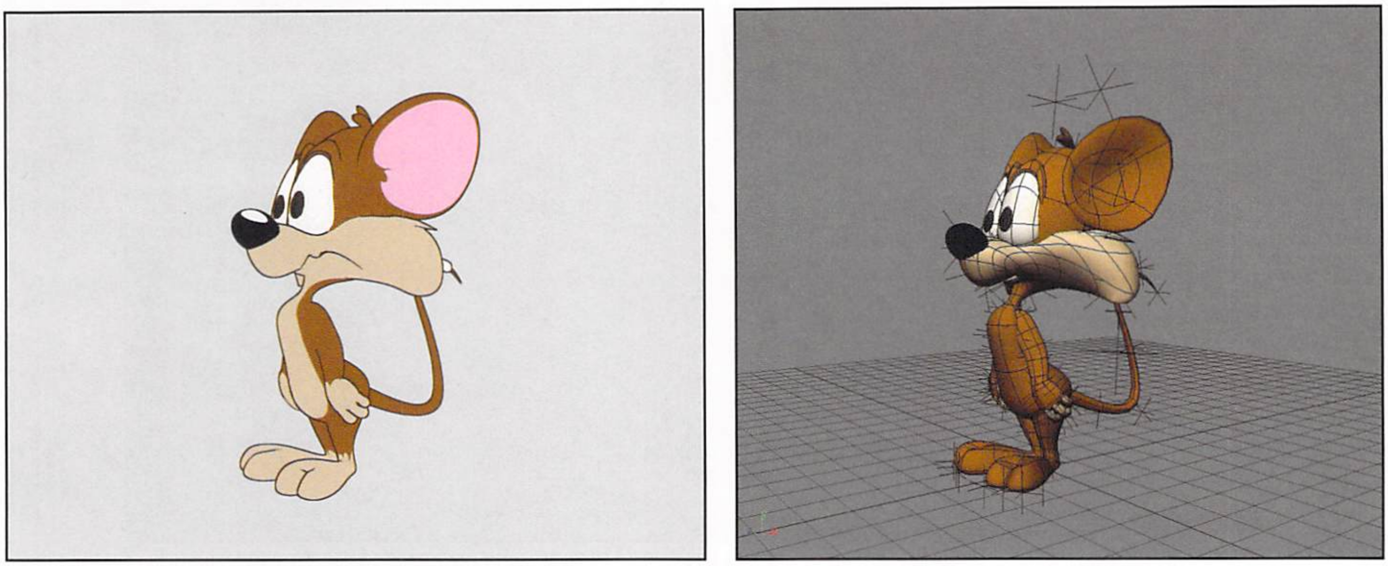
While the shape animation workflow is fairly simple and straightforward to use, it comes with a number of limitations that may frustrate the animator seeking precise control, along with providing a few surprises:

1 Most shapes are in-betweened in a linear fashion. That is, points move from their positions on the first shape key in a straight line to their positions in the next shape key, which makes it quite difficult to create motion where portions of the surface need to rotate or move in an arc-like fashion (think of a long ribbon flowing through air or water). Some of the available shape blending modes can alleviate this to a degree, but not completely. The workaround is to create extra shape keys as in-betweens to fill in the gaps — which brings us to issue number two ...

2 Shape animation can be a very laborious process. In many cases, almost every point on the surface needs to move by some degree in every shape key for proper in-betweening to take place. This can be problematic when motion is very subtle, as there are no guides to judge exactly how much to move a point — or which point to move — in order to get the desired look. The end result is often a surface that appears to creep or crawl. The new secondary shape animation mode in the operator stack helps, but can be a pain, as you are limited to visual inspection without any methods to numerically compare shape keys to see if the current shape is correct or properly biased towards the previous/next shape key. That is, you must be able to put points exactly where they need to go with the mouse, as you cannot type in numerical values to place a point precisely relative to a shape key.

3 There is no access to the recorded values of the shape keys other than blend weight. When storing shape keys, pose clips are created for use in the animation mixer, but there is no information to preview a shape key or indicate how one pose differs from another, which points within the shape key have been altered, or by how much. Some form of scrubbing the timeline around clips inserted on dummy tracks in the animation mixer is usually involved. This is cumbersome to say the least. Sometimes it's helpful to know the position coordinates of points in the shape to determine how much it needs to be moved for the next key.

4 Shape animation limits options. Shape animation is based on changes in topology of the affected object, whereas many other tools operate on the transformations of the kinematics property (such as constraints), which makes it difficult to blend the two workflows together or use the output of one to drive the other. If geometry is modified, the IDs of the points can become relabeled/reordered, causing existing animation to be mangled or lost, as shape keys use IDs of the points to identify which ones are deforming on the surface. If a client asks for radical changes, you may have to scrap all your work and start again from scratch. There is nothing more deflating than losing valuable time and energy on a project which should be near completion.



ABOVE LEFT: SQUEAK RENDERED IN FULL COLOR. ABOVE RIGHT: SQUEAK RIGGED WITH NULLS, NO BONES.

I recognize the advantages of shape animation in given situations, but I try to steer away from it as much as possible. I prefer pipelines to be clean, flexible and open, with an escape route available should something go horribly wrong, requiring immediate attention. I prefer simple and consistent workflows that can be adapted to a wide variety of situations, as it's easier to troubleshoot problems when there are fewer variables to keep track of. It's also easier to teach others the method when time is short and their experience is limited. While working many late nights and nearly missing several deadlines due to shape animation limitations and risks, I decided to look for alternatives that fit very specific criteria:

1 **FLEXIBILITY** - It must work with most toolsets in XSI without painting projects into a corner and allow for last minute changes while preserving work already completed.

2 **SIMPLICITY** - It should be easy to set up, maintain, and edit, have bi-directional workflow, and must be easy to understand and explain to others not familiar with it.

3 **CONSISTENCY** - Should use workflows already common in other areas of the software, allowing animators to jump between tasks without having to continually think which buttons to push or which workflow to use.

4 **RELIABILITY** - Should be able to withstand heavy use without breaking down, but have an escape route should it fail.

I spent time analyzing several tools, such as the lattice, curve deformation, and skeletons, to drive deformations, but each had drawbacks. Some were easy to implement but difficult to use. Others were fun to work with, but not reliable or predictable. In any event, it opened my eyes to the possibilities of not only what could be done, but also what could possibly go wrong at the worst possible time. Sometimes it's more important to know what NOT to do.

I first tried the lattice, as it was familiar, simple, and flexible, but soon dismissed it as not being direct enough. Shape animation offered direct manipulation of the surface. To get that same level of control with a lattice required increasing subdivisions until it became too dense.

Next I tried another popular alternative: skeletons. Using single-bone chains, I'd apply geometry as an envelope to the skeleton and manipulate the bones to drive the deformations. It offered flexibility, as I could place bones into a hierarchy and create complex motions with minimal effort and retain the use of powerful animation tools such as constraints. I could also reduce manual labor by not having to move each point on the surface individually. Instead, I could assign a bone to a group of points and assign variable weighting to prevent the surface from buckling or crimping. Basically, the bones became handles. However, there were problems with controlling skeletons, as each bone was accompanied by a chain root and an effector, which would override animation applied directly to the bone if they were mistakenly keyed. Simple systems were predictable, but as the bone count grew and animation became complex, unexpected motions started to arise and were often difficult to track down and correct. Two steps forward and one step back, but it did produce some positive results. With a little more investigation, I came up with my final solution – nulls as envelope deformers.

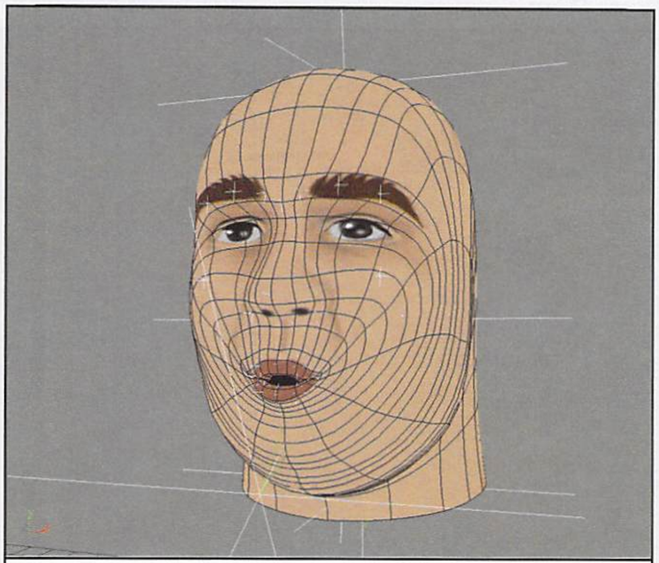
The "nulls as deformers" method takes a little time to set up, but has many advantages over the shape animation workflow while fulfilling my four goals of being simple, reliable, flexible and consistent.

First, it's flexible in that it's based on skeletal envelopes and transforms. Multiple points on the surface can be assigned to a null or multiple nulls, then weighted for smooth or rigid transition, depending on the situation. If the underlying surface needs to be modified or swapped, the envelope operator can be muted while the changes are made. Animation will be preserved because it resides on the nulls, not the geometry, so no fear of lost work – an asset when working under pressure and tight deadlines. It's also useful as an animation exchange system, as motion can be created on a low resolution surface, then transferred to a higher resolution surface (or vice versa) by applying and weighting the envelope accordingly.

Second, the system is simple; it consists of only nulls and an envelope operator with its associated weight map, which keeps the learning curve fairly small. Assigning nulls to the surface is a simple matter of painting weights using the weight brush. Nulls can be placed in any type of hierarchical arrangement desired and manipulated using basic transform tools (or advanced tools such as constraints). For deformation control, nulls can be distributed where needed – more nulls in areas of detail, and fewer where little or no movement occurs. If problems arise, there are fewer places to investigate, which reduces the troubleshooting process to a quick inspection – a time saver.

Third, the system is consistent, as nulls are animated and edited using the same tools as for other objects. That is, the nulls are animated using the basic transform tools, and data appears the same in the animation editor and mixer (when inspecting clips and sources) as Function Curves with familiar position, orientation, and scaling values along a time line. This allows animators to jump between tasks without thinking about which tool they must use. Also, precise control is always available, as values can be edited numerically in the text edit boxes accompanying the editors and property pages.

Finally, the system is reliable. It's rare for transform tools to become corrupted in a tired scene. If geometry fails or becomes corrupt, it can be replaced with another object. If the envelope operator fails, it can be reapplied and reweighed, or plotted as shapes so work can continue. As mentioned before, animation is not lost because it resides on the nulls, not the surface.


NULLS USED TO DEFORM FACIAL FEATURES FOR LIP SYNC ANIMATION

NULLS AS DEFORMERS

The basic premise is that nulls will act as handles, which can be manipulated to deform the surface, much like grabbing the points themselves, only there will be fewer nulls which have more degrees of freedom. To set up, the system requires a surface to be deformed and a set of nulls. The nulls should be placed around the surface where it is intended to be deformed. For example, on the head of a character, most of the nulls will be located around the face (cheeks, lips, eye brows, nose, etc...), with a few around the ears and throat, and none around the top and back of the skull. See example figure above.

A successful system will have nulls arranged in a hierarchy where parent nulls can be manipulated to control several child nulls that control smaller regions of the surface. For example, a null at the base of a mouth (jaw), but more child nulls distributed around the lips. When the jaw null is rotated, the lip nulls move with it in unison, but the lip nulls can still be manipulated individually with their offsets relative to the jaw. One advantage of using nulls in this fashion is that the parent of a particular branch can be easily rotated or scaled to create wrinkles, folds, puffiness, pinching, or puckering with minimal hassle as transformations are propagated throughout the branch.

So, how does this system work? Let's walk through a few simple examples. First we'll use a simple sphere and a few nulls to demonstrate the concept, and then move onto a more complex example involving the cloth simulator.

1 *Get > Primitive > Surface > Sphere.*

2 *Get > Primitive > Null.* (Create seven nulls.) Leave one null at the origin named "n_nulls"; make the other nulls the children.

3 Translate one null along each of the six axes of the sphere until they reside near the sphere's surface.

4 Put the child nulls into a group by selecting them and pressing the "Group" button on the Main Control Panel (MCP for short). Label the group "G_nulls" in the resulting Property Page.

6 With the sphere selected, *Animate > Envelope > Set Envelope,* then pick the "G_nulls" group in the explorer when prompted. Right-click to end Pick mode.

7 Select and translate nulls individually as desired. Set keys by activating a Transform tool, then pressing 'K' to set a key.

As you manipulate the nulls, notice how rotating and scaling the nulls can create folds and wrinkles. Adding nulls and placing them closer together can create sharper creases.

THINGS TO TRY:

– VOL scaling mode on the individual nulls.

– Rearrange the null hierarchy to get different behaviors when transforming.

– Draw a NURBS curve and use *Animate > Path > Set Path* to put a null on the curve.

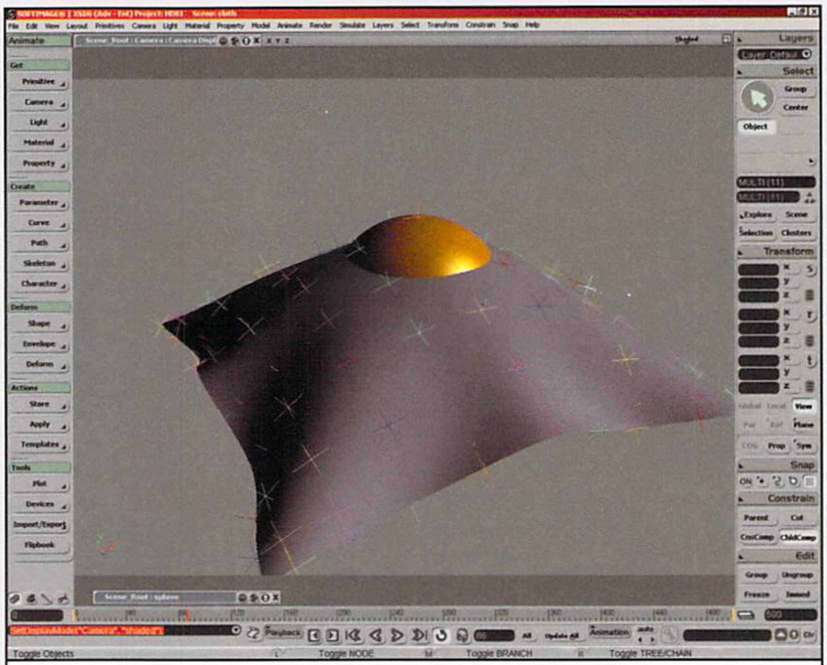
–Constrain a null to another animated object in the scene.

–Use the bounding volume constraint to constrain the nulls to an implicit sphere/cube for cheap obstacles or deformations.

The main point, as you can see, is this workflow retains full capability to put the null on a path, constrain it to another object, or even make it drive other objects within the scene, all while deforming the surface. The default weight distribution of the envelope fits the nulls fairly nicely, too. Of course, tweaking will be required for more complex geometry such as a character's face, but you get the idea.

SIMULATION:

The most frequent use of the *"nulls as skeleton"* method will be to create animation from scratch by employing the nulls as handles to the surface, but there are other important uses. One example is cloth simulations. The advantage is that the nulls can be constrained to the points on the cloth surface so when the simulation is run, the nulls will inherit the motion generated by the cloth simulator. When semi-desirable results are reached (or at an impasse), the motion can be plotted to the nulls and used in the animation mixer to tweak or enhance the results. For example, to nail a portion of the cloth down, localize undulation of the surface, or correct mistakes made by the simulator such as penetrating obstacles. The workflow is generally the same as before, but with the added step of using the object-to-cluster constraint to constrain each null to a point on the cloth surface. Creating a null for every point on the surface is not necessary, as the weighting supplied by the envelope operator will fill in some of the void between nulls. All that matters is that nulls exist where the fabric deforms.



SOME SIMULATION ENGINES ONLY PROCESS POINTS ON SURFACES RATHER THAN THE SURFACE ITSELF, LEADING TO ERRORS

1 *Model > Primitive > Surface > Grid.* Name it "fabric" in the resulting Property Page. This will be the cloth.

2 *Simulate > Force > Gravity.* Keep default values.

3 With the fabric selected, *Simulate > Cloth > From Selection* to apply the cloth simulator.

4 *Model > Primitive > Surface > Sphere.* This will be the cloth obstacle. Reduce the radius to a value of 1.5, and then translate it just below the fabric.

5 With the fabric selected, *Simulate > Environment > Set Obstacle.* Pick the sphere, then right-click to end Pick mode.

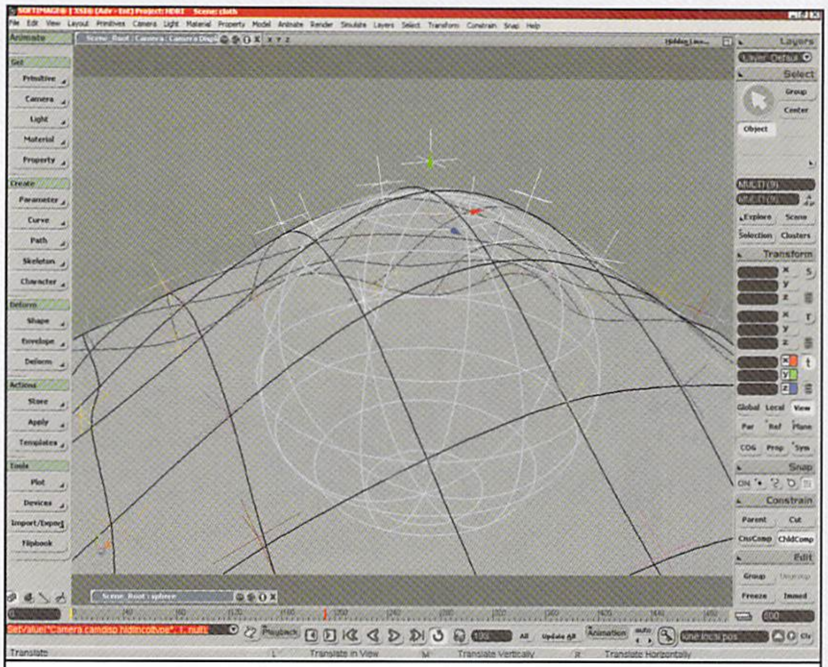
6 Press *Play* to watch the simulation. Increase the frame range if necessary for full results.

The fabric should collapse around the sphere in a wrapping fashion. Pay special attention to the top of the sphere as it penetrates the fabric. See example in the figure shown above. We'll use the "nulls as skeletons" method to correct this problem.

7 Go to the first frame of the scene, then select the fabric.

8 *Model > Primitive > Null.* This null will be copied and distributed across the fabric, so keep it visible in your schematic view.

9 With the fabric selected, run the ML_Duplicator script (which can be


Animate
Get
Primitive
Camera
Light
Material
Property
Create
Parameter
Curve
Path
Skeleton
Character
Deform
Shape
Envelope
Deform
Actions
Store
Apply
Templates
Tools
Plot
Devices
Import/Export
Flipbook
Layers
Select
Group
Center
Object
Explore
Scene
Selection
Clusters
Transform
Global
Local
View
Snap
Constrain
Parent
Cut
CnsComp
ChildComp
Edit
Group
Freeze
Immed
Playback
Animation
Translate
Translate in View
Translate Vertically
Translate Horizontally

NULL DEFORMERS CAN CORRECT ERRORS FROM SIMULATIONS BY ADDING AND BLENDING OFFSETS

found at www.mantom.net in the download area). In the popup dialog, activate the "Constrain" option (This constrains the nulls to the points on the fabric). Click *OK*, then pick the null created in the previous step.

After a few seconds you'll see the nulls appear on the fabric surface. However, they may be a bit large in the viewports, making selection and viewing difficult.

10 With the child nulls selected, press *<ALT + ENTER>* to open a multi-PPG. Click the "Null" tab and set the size to 0.25. Then press *<ENTER>* to accept. This should reduce the display of the nulls to a more manageable size and is preferable to scaling the nulls with the Transform tools.

11 With the nulls still selected, press "Group" on the Master Control Panel (or use *Edit > Create Group*). Name the group "G_nulls" in the resulting Property Page.

Now that the nulls are in place, let's transfer the motion from the cloth simulator to the nulls:

12 Right-click on the G_nulls group created in the previous step, and choose "Select members" from the context menu that appears under your mouse cursor.

13 Open a multi-PPG for the nulls and click the keyhole icon in the top right corner of the Property Page (next to the "x") to keep it onscreen. Go to the "Local Transform" tab and while pressing *<CTRL>*, mark the X, Y, and Z parameters for rotation and position.

14 *Animate > Plot > Marked Parameters.* Press OK to accept default values. This will plot the motion of the cloth simulation onto the nulls as Fcurves.

15 In the multi-PPG, click the "Object to Cluster Cns" tab, and then uncheck the "Active" parameter to turn off the constraints. The nulls are now driven by the plotted Fcurves instead of the cloth simulation.

16 *Animate > Store > Marked Parameters - Fcurves.* In the resulting dialog, enter "simulation" in the Action Name parameter text edit box. Press *OK*. This removes the plotted Fcurves from the nulls and stores them as an Animation Source for use within the animation mixer.

17 Create another grid (don't duplicate the existing fabric surface), then make it the envelope of the nulls by selecting the grid, choosing *Animate > Envelope > Set Envelope* from the animation toolbar, then pick the G_nulls group to assign the nulls as deformers. Right-click to end Pick mode.

18 With the nulls selected, open the animation mixer and click the recycle button (circular arrows) at the top of the animation mixer. On the empty track, right-click and choose "Insert source," then pick the "simulation" clip. This will reapply the cloth simulation on the nulls, which will in turn drive the deformation of the 2nd grid.

Now, let's correct the penetration of the sphere.

19 Go to the first frame of the scene.

20 Select the nine nulls that are in the center of the fabric. See example above left.

21 Press *<ALT + ENTER>* to open a multi-PPG. Mark the XYZ parameters for local position and rotation.

22 *Animate > Store > Marked Parameters* – Current Values to store the current location of the nulls. Name the clip "mid_section" in the resulting dialog, then press OK.

23 Right-click on an empty track in the animation mixer, then load the mid_section source you just stored. Grab the center (vertically) of the right/left ends of the clip and drag to resize the clip to fit the scene. Don't drag the corners, as that creates cycles.

24 Go to the end of the scene and look at the penetration of the sphere in the viewports.

Notice the sphere no longer penetrates the fabric. However, we have a new problem as the nulls sit too high over the sphere, creating an unnatural look.

25 Reduce the value of the mid_section weight slider in the animation mixer (right side of mixer). Lower the value until just before the sphere pokes through.

Press *Play* to watch the simulation again. The cloth should now fall correctly over the sphere, but you might need to animate the value of the mid_section weight slider to fade in so the cloth doesn't hang before the cloth falls. If it's not to your liking, simply repeat the steps to correct the penetration, but move the nulls into better locations to create a more convincing look. If you don't like the simulation as a whole, you can re-activate the "Object to Cluster" constraints on the nulls in a multi-PPG and re-plot the motion for further editing. The motion previously stored from the older simulations can still be blended with the new simulations if needed.

A feature that requires mentioning is the ability to repeat motions of the cloth seamlessly on a loop. For example, if one of the corners needed to flap about repetitively in the wind, motion can be plotted (or manually keyframed) and stored as a source, then loaded onto the mixer and cycled by dragging the corner of the clip. It can be applied to the cloth as a whole or just on a few nulls. The cycles can be made seamless by right-clicking on the clip and using the Animation Editor to adjust the position Fcurves of the nulls so the first key matches up with the last. If working with motion capture data, try the "Find Cycles" tool from the clips menu to isolate repeating motion automatically.

Another advantage of the "nulls as deformer" method, in the case of the cloth simulator, is the ability to anchor portions of the fabric as if pinned to the floor or another object. This is easily accomplished by storing the global positions (not local) of the nulls in a clip. When placed on the mixer, the global positions will override the local positions stored in the plotted simulation clips, resulting in the nulls sitting still. Optionally, the global positions can be blended with constraints as constraints reside on the global transform parameters.

CONCLUSION:

The "nulls as deformers" method may require more initial setup, but it offers more flexibility during production than shape animation, while providing a safety net should things go wrong at the most inconvenient moment ... such as when the director asks for radical changes late Friday night just when you're trying to head out for the weekend.

With practice, you'll soon discover that rarely do you need as many nulls as points on the deformed surface. By keeping the system simple, it becomes easier to edit your work as it progresses and lowers the learning curve for those new to XSI that have to jump in at the last moment to assist you. If you desire simplicity, consistency, flexibility, and reliability in your workflow, then consider using the "nulls as deformer" method.

MATT LIND IS A CHARACTER ANIMATOR, TECHNICAL DIRECTOR, AND SOFTIMAGE-CERTIFIED INSTRUCTOR AND FOUNDER OF MANTOM EDUCATION & TRAINING IN CHICAGO, IL. MATT HAS VAST EXPERIENCE IN COMPUTER GAMES DEVELOPMENT AND HAS WORKED IN A VARIETY OF ROLES FOR CLIENTS, INCLUDING WARNER BROS., HASBRO/MATTELL, TERRAGLYPH, INTEL, VIACOM.PARAMOUNT, DISNEY, AND MORE. MATT IS AVAILABLE FOR ONSITE CERTIFIED XSI TRAINING AS WELL AS PRODUCTION WORK. IN HIS SPARE TIME, MATT WATCHES / PLAYS SPORTS, COLLECTS MUSIC, AND ATTENDS EVENING CLASSES IN PURSUIT OF A 2ND COLLEGE DEGREE IN ENGINEERING.

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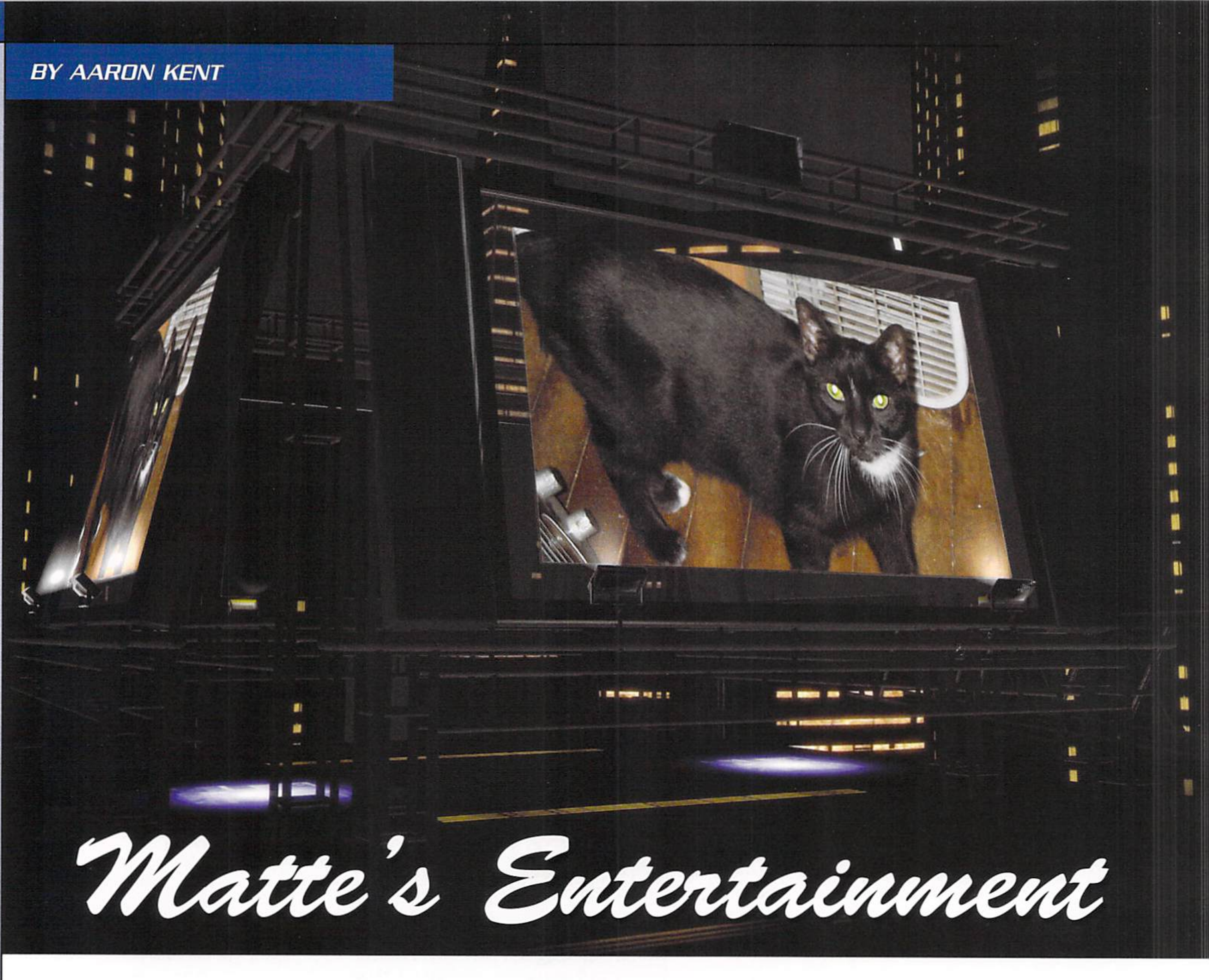
BY AARON KENT

Matte's Entertainment

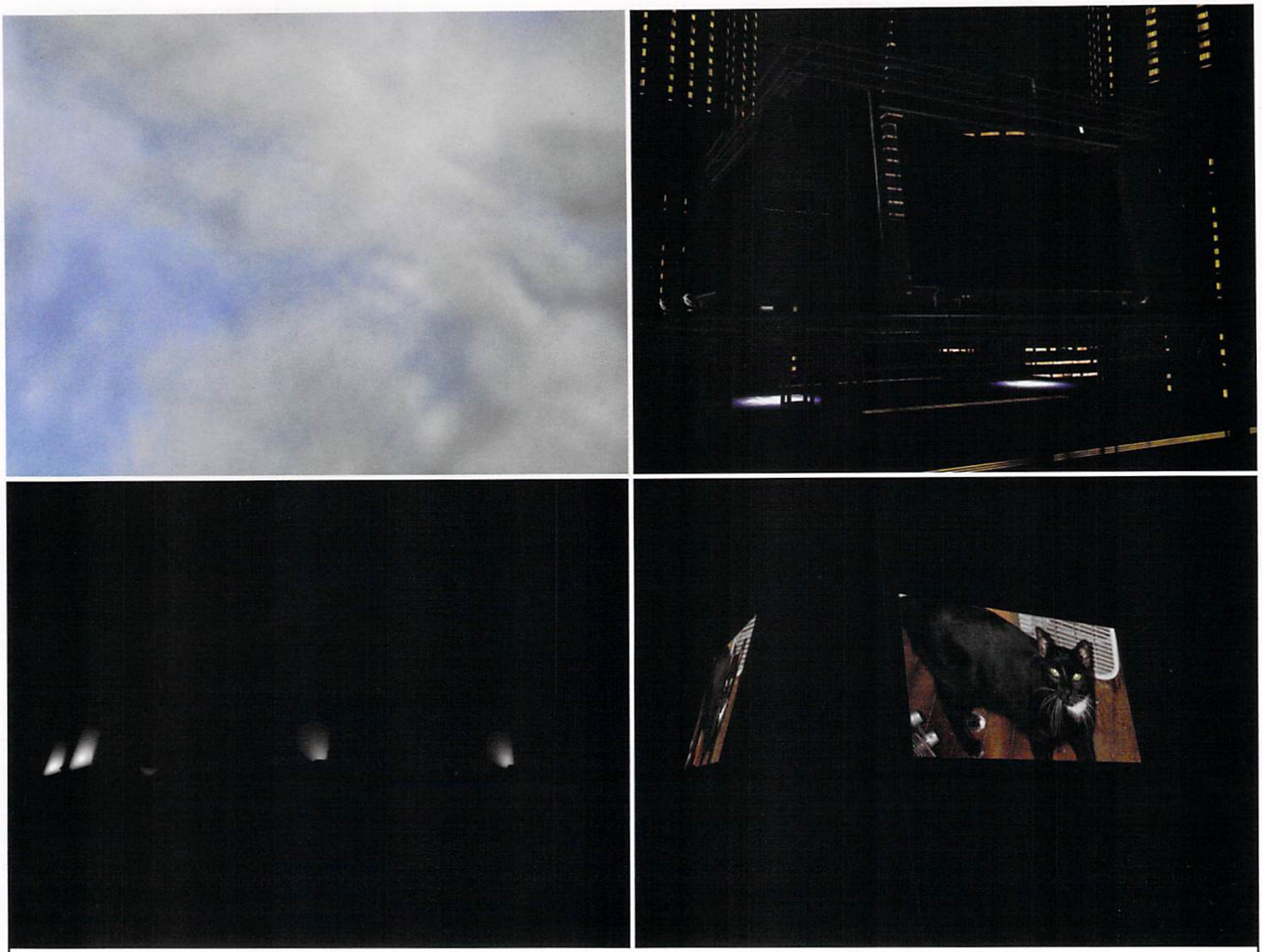


Whether you're watching a blockbuster movie or a slick TV commercial, you can take it for granted that any 3D content spent some time inside a compositing program. Rendering out your scenes in a number of passes is the best method for achieving professional-looking results. 3D design and animation for broadcast TV is quite different from its privateer or Hollywood counterparts, most significantly in terms of budget and time constraints. Big budget films have money for 3D companies with dozens, if not hundreds, of talented artists working days or weeks to complete a shot. If you design for television, on the other hand, you're quite often on your own, in charge of modeling, texturing, animating and rendering, all in a fraction of the time. LightWave 3D's Matte Objects option offers you a solution to quickly isolate different objects in your LightWave scenes and generate whatever alpha channels you need to composite your renders. Having this ability increases your flexibility when working on projects or renders of any size.

I recently completed a job that required me to build a nighttime cityscape with buildings and roofs that are populated by large-screen television monitors playing various music videos. Modeling the city and animating the camera fly-throughs was fairly straightforward. However, I didn't know how close to the project deadline I would receive the artist footage. With that in mind, I rendered each scene in several different passes. To help demonstrate this process, let's take a look at one of the scenes. The image above shows the final composite (I've traded out the video with my cat Buddy, as he's a lot less likely to sue me for publishing his picture in this magazine). Each scene was broken up into four passes: a sky pass, background pass, screen pass, and volumetrics pass. Once the animation was completed, I could render out every pass except the screen pass, since I was still waiting on footage. This preparation was essential in meeting the project deadline. As I received the late footage, I rendered it using LightWave's Matte Objects option.

THE ABOVE IMAGE IS A FINAL COMPOSITE OF ALL THE RENDER PASSES.

Before I explain how to set up each scene to render, let's take a look at each separate pass. Just a note: when I refer to passes, I'm talking about breaking different objects out of a scene, not surface attributes. Render passes can also refer to a beauty pass, specular pass, occlu-



CLOCKWISE FROM *TOP LEFT*: *SKY PASS*– A RENDER OF THE SKYDOME, READY FOR COMPOSITING. *BACKGROUND PASS*– JUST THE BUILDINGS AND MONITORS RENDERED. NOTE THE SCREEN IS BLANK. *SCREEN PASS*– JUST THE SCREEN WITH FOOTAGE ON IT. *VOLUMETRICS PASS*– JUST THE VOLUMETRIC LIGHTS.

sion pass, etc. I didn't have that luxury on this job. Due to the time constraints, I got my final renders close to what the creative director wanted and then did simple color correction and finishing in After Effects.

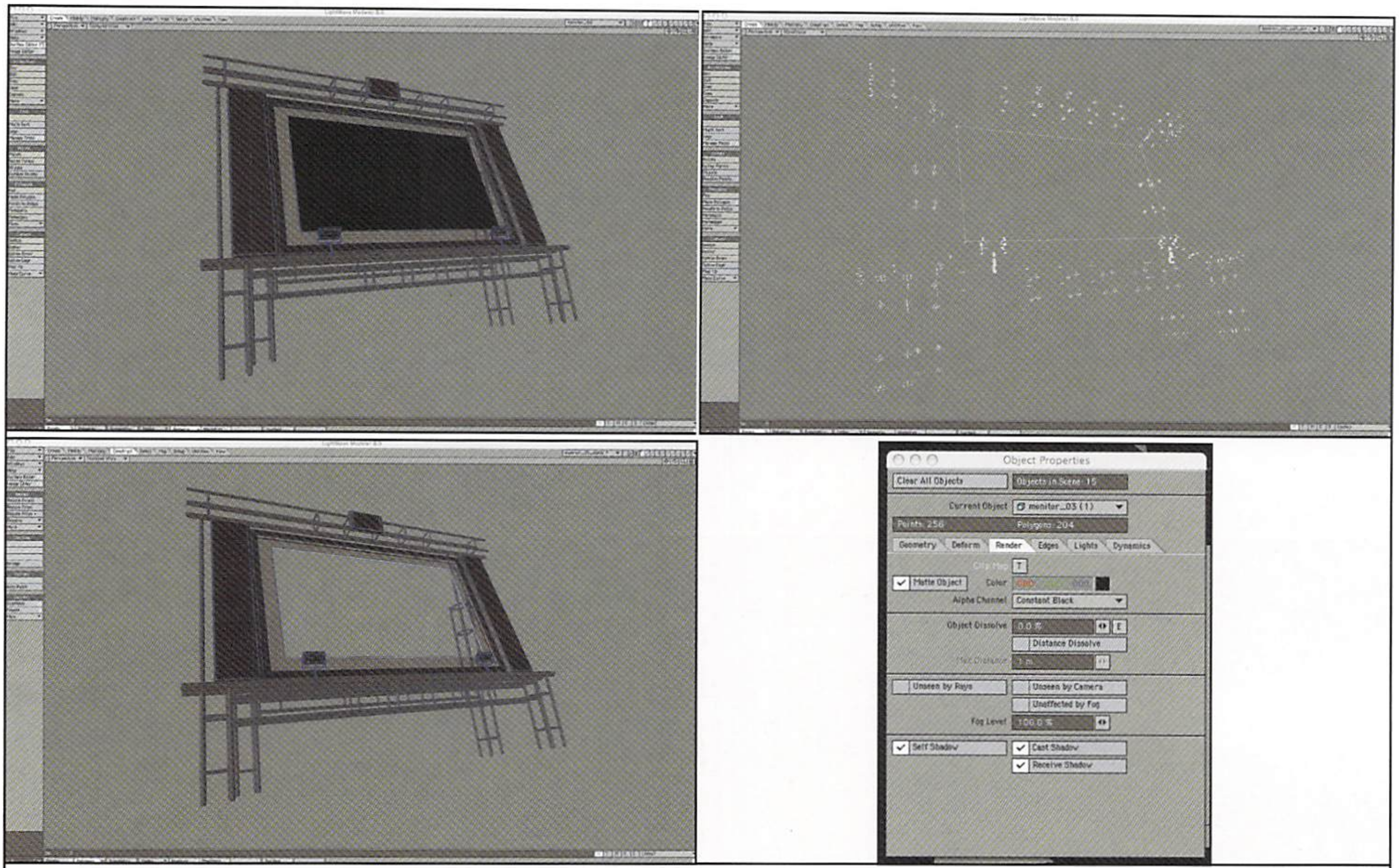
Here's a description of the passes I rendered:

SKY PASS: Simply a render of the sky for separate color correction in After Effects.

BACKGROUND PASS: All the buildings in the city, as well as the monitors. Notice that the monitor screens are black. Even though the screen pass is placed over the monitors, it's best to make them black. If we rendered the background pass with something playing on the screens, the screens' edges would run the risk of buzzing once the artist footage was composited on top.

SCREEN PASS: Just the monitor screens. The artist footage is the "hero" in each of these scenes. In television speak, that means that it's the element to which you really want to direct attention. When I composite each scene together in After Effects, my goal is to make the footage in the monitor really take precedence. With that in mind, it's best to render out the footage without any harsh light, or too little light pointed at it. In the screen pass, I delete all the lights from the scene file and exclusively use luminosity and diffuse values with a little ambient lighting turned on to get the render pass. The more adjustments that I can achieve in After Effects with Levels, Hue, Saturation, etc., the better off I'll be when the creative director and client start making changes. And trust me, they will.

VOLUMETRICS PASS: The volumetric lights rigged to point at the screens.



Object Properties
Objects in Scene: 15
Current Object: monitor_03 (1)
Points: 256
Polygons: 204
Render
☑ Matte Object
Color: 000 000 000
Alpha Channel: Constant Black
Object Dissolve: 0.0 %
☐ Distance Dissolve
Max Distance: 1 m
☐ Unseen by Rays
☐ Unseen by Camera
☐ Unaffected by Fog
Fog Level: 100.0 %
☑ Self Shadow
☑ Cast Shadow
☑ Receive Shadow

TOP LEFT– MONITOR.IWO– THE MONITOR OBJECT. NOTE: SCREEN IS BLACK IN THIS VERSION. *TOP RIGHT*– MONITOR_JUST_SCREEN.IWO– A VERSION OF THE MODEL WITH JUST THE SCREEN POLYGON SCREEN RETAINED. NOTE THAT I'VE LEFT ALL THE OBJECTS POINTS AND ONLY DELETED THE POLYGONS. KEEPING THE DIMENSIONS OF EACH MODEL THE SAME IS ESSENTIAL. *BOTTOM LEFT*– MONITOR–MATTE.IWO THE MONITOR MODEL WITH THE SCREEN POLYGONS DELETED. *BOTTOM RIGHT*– EACH OBJECT'S MATTING OPTIONS ARE ACCESSED HERE ALONG WITH ITS MATTE OBJECT ALPHA OPTIONS

To create the passes there are three versions of the monitor object:

monitor.lwo
monitor_just_screen.lwo
monitor_matte.lwo

monitor.lwo is the entire monitor model with the screen polygon changed to black (no diffuse or luminosity value).

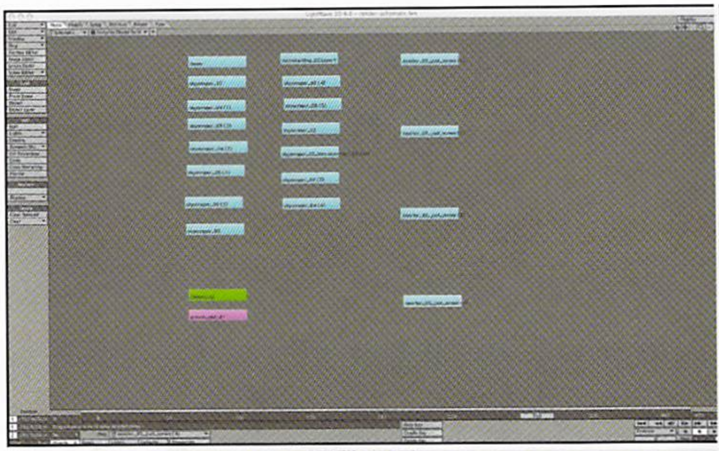
monitor_just_screen.lwo is just the screen polygon. I deleted all other polygons in this model, but retained the points. I did this because, although the points don't show up in the renders, retaining them keeps the dimensions of each model the same. When the models are swapped out in the screen and volumetric passes, they would shift position if the dimensions were different.

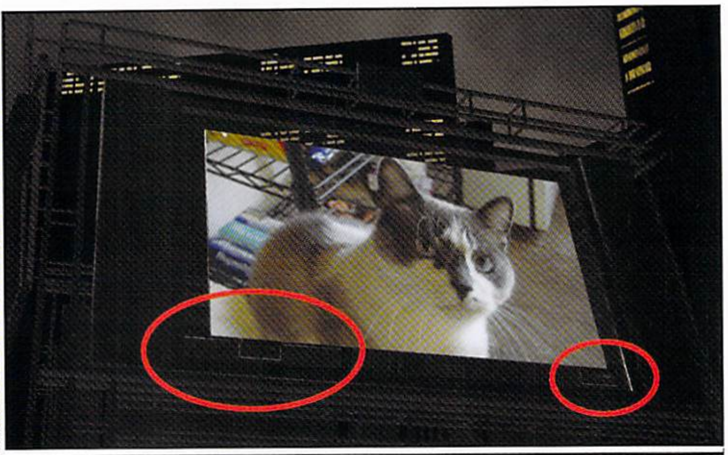
The monitor_matte.lwo is the monitor with the screen polygons deleted. Deleting these polygons allows for the spotlights to cut an alpha if they ever pass over the screen polygon.

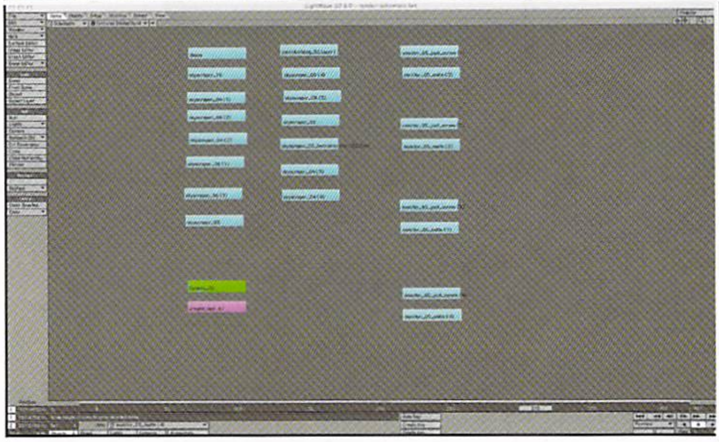
Both the sky and background pass are straightforward. They don't require any complex matting. The sky pass is just camera position data exported as a LightWave .mmf file and imported into a scene with a huge sphere textured with a sky image. The background pass is rendered with the monitor screens black and the volumetric lights turned off.

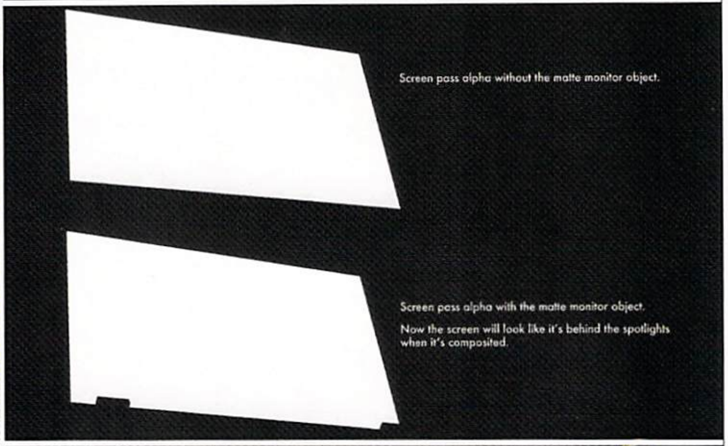
In the screen pass, I turn all objects except the monitors into matte objects. To do so, I open each object's Properties panel, go to Render Settings, activate the Matte Object option, and select Constant Black for the alpha setting *(See Image Above)*. Matte Objects will color your objects any solid color you choose unless you activate one of the alpha options. There are three to choose from: Use Surface Settings, which uses each object's surface attributes to calculate the alpha, Unaffected by Alpha, which disregards the object when calculating the alpha, and Constant Black, which considers the object 100% opaque when calculating the alpha. I use Constant Black because I don't have any transparent objects in these scenes and I assume that it will render a little faster because it doesn't have to factor in each object's surface settings and textures, only its geometry. If you're running LightWave [8], as a time saver you can also open the Scene Editor, select all the objects in the scene, and open the Properties panel. Activating the Matte Object option then activates it for all selected objects.

Now let's address the monitors. I want to see the screens and make sure the spotlights affect the alpha channel. In the schematic view, I select each of the monitor objects and use the Replace Object command to swap in the screen objects. *(See image facing page)* This is OK, but I still need the monitors to be



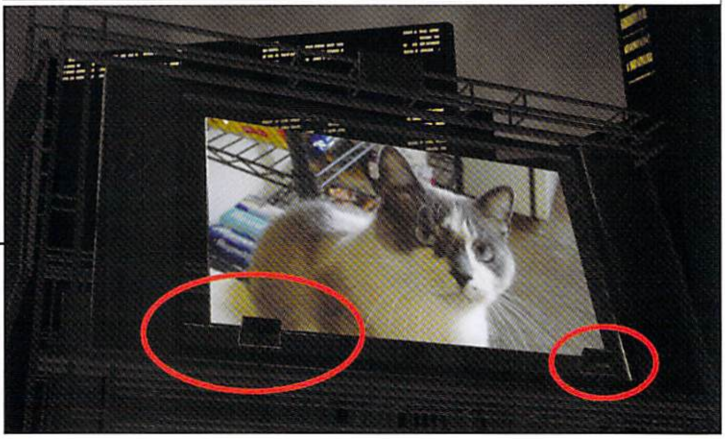






Screen pass alpha without the matte monitor object.

Screen pass alpha with the matte monitor object.
Now the screen will look like it's behind the spotlights when it's composited.



TOP LEFT– I SELECT EACH MODEL IN THE SCENE AND REPLACE IT WITH THE MONITOR_JUST_SCREEN.LWO. *TOP RIGHT*– WITHOUT THE RIGHT SETUP THE SCREEN PASS WILL COVER THE SPOTLIGHTS ON THE BACKGROUND PASS. *LOWER LEFT*– HERE I'VE CLONED EACH MONITOR AND SWAPPED IN THE MONITOR_MATTE.LWO FOR EACH. *MIDDLE RIGHT*– HERE ARE THE TWO ALPHAS. THE TOP DOESN'T HAVE THE MATTE OBJECT IN THE SCENE TO CUT THE SPOTLIGHTS OUT. *LOWER RIGHT*– NOW THE SCREEN APPEARS TO BE BEHIND THE SPOTLIGHTS.

matte so that the spotlights will appear over the screen. If I rendered and composited at this point, the screen would cover up the little spotlights in front of them, as shown in iamge at top right (featuring my other cat, Slicer). I then clone each screen object and replace the clones with the matte monitor objects, remembering to turn Monitor_Matte.lwo into a matte object in the Properties/Render panel. Once that's done, the screen renders out and doesn't crop the lights.

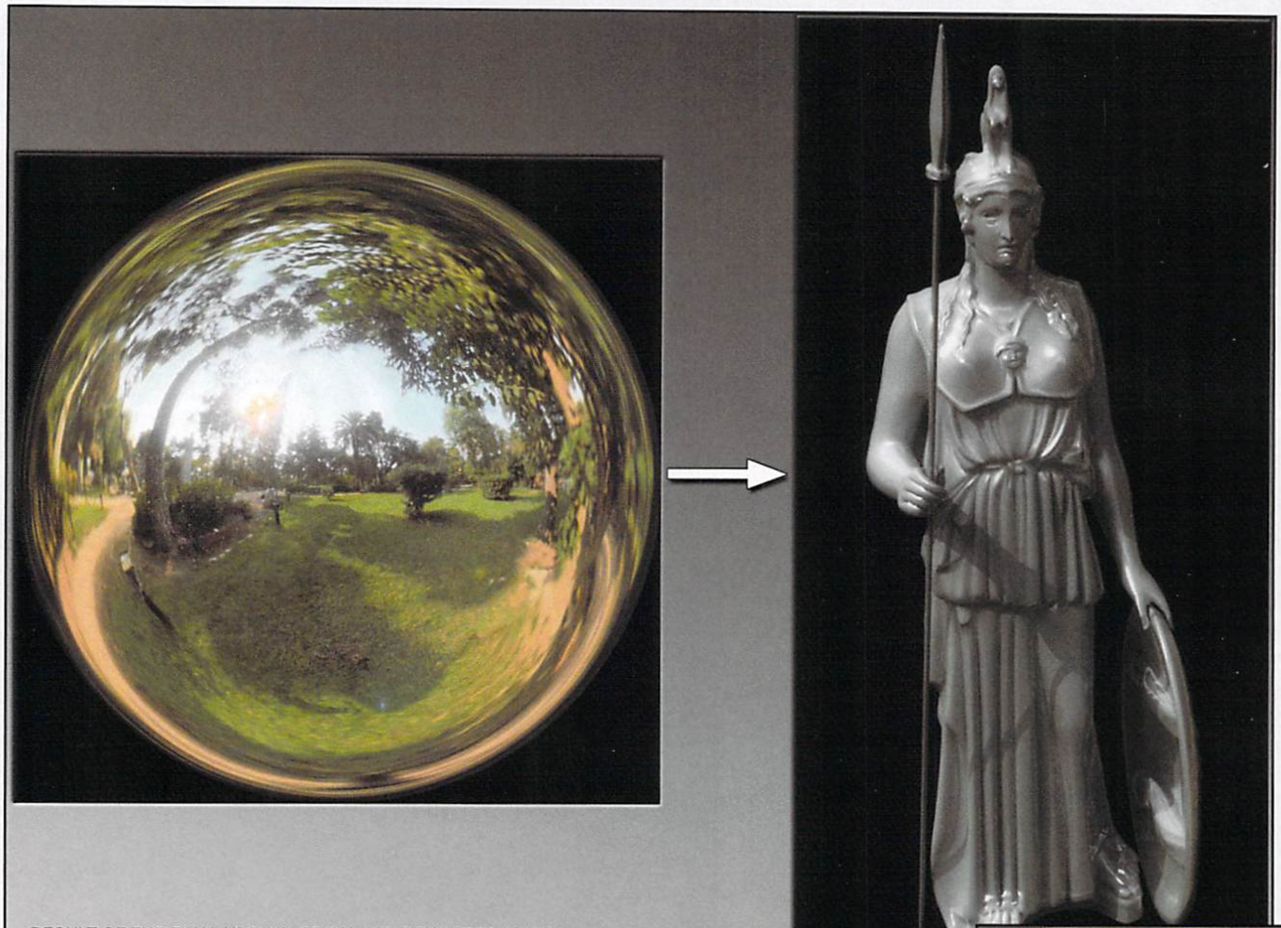
The volumetric pass is achieved using the same method. All the monitors in the scene are swapped out with the Matte_Monitor object. The other objects in the scene are turned into matte objects and all the lights except the volumetrics are turned off. Now the volumetrics composite over the screen, but seem to come from behind the spotlight bodies, not on top of them.

Well that's it. Plan out your projects in advance and see how many different passes you can render out. Whatever the job, your 3D content will benefit from some post-processing and the more objects you have isolated, the more exacting adjustments you can make. In the world of broadcast design, this useful skill can not only affect the quality of your work, but also make the difference between finishing a job on time or not.

AARON KENT HAS BEEN AN "AFTER EFFECTS GUY" IN NYC FOR ABOUT FIVE YEARS. HE USED TO BE A CARPENTER, BUT GOT TIRED OF SHEETROCK AND BACK PAIN. HE HAS RECENTLY STARTED TRYING TO BE A "LIGHTWAVE GUY." HE WORKS DURING THE DAY FOR A DESIGN AND ANIMATION COMPANY: *WWW.SHIFTLESSDREAMS.COM*. HE WANTS TO CREATE A SHORT ANIMATED FILM IN LIGHTWAVE. IF HE EVER GETS TO IT YOU'LL FIND IT AT: *WWW.SHIFTLESSDREAMS.COM*. HE CAN ALSO DRINK A LOT OF BEER.

BY GREGORY GLEZAKOS

Creating High Dynamic Range Environments



RESULT OF THE FINAL HDR IMAGE ON A 3D RENDERED MODEL.

INTRODUCTION

Acquiring a High Dynamic Range (HDR) panoramic photograph of a live set, and then using it as a source of illumination for Image-Based Lighting (IBL) in a 3D application, is an efficient way to composite rendered computer graphics elements into live action scenes. So, if you ever want to insert 3D objects into live action plates, your best bet to properly light and render them in your 3D program is to go on location and shoot an HDR photo of the area surrounding the set where your object will be inserted and use that HDR image for Reflection, Diffuse, and Specular lighting. With this tutorial, we are going to learn how to photograph and create a 360° panoramic environment using a digital camera and a reflective chrome mirror ball, which is the most trusted and widely used method for acquiring High Dynamic Range data from a set for Image-Based Lighting use in any 3D application. We'll also see how to use off-the-shelf software to construct the HDR image from our photos, and we'll learn how to deal with the problems that come along with this technique.

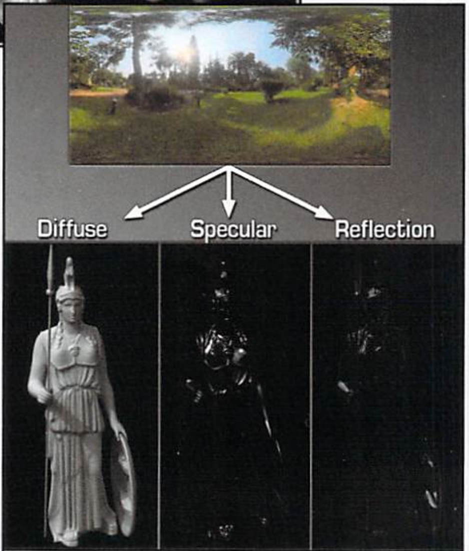


FIG. 1– REFLECTION, DIFFUSE, AND SPECULAR LAYERS USING AN HDR IMAGE

METHODOLOGY

Now, there are many ways to shoot a 360° panorama. Some of the most common are:

1. Using a camera with a 6 - 10 mm fisheye lens attached
2. Using a camera and a mirror ball
3. Using a camera and a tripod only
4. Using a PanoScan camera from www.panoscan.com
5. Using a SpheroCam HDR camera from www.spheron.com

The last two methods are, of course, the best and most exotic. This means that they can produce the HDR photo for you almost automatically, ready for direct use in your 3D software, but probably at a price not suitable for personal or home use. Using fisheye lenses to produce panoramic photos is a faster way than using mirror balls, but then you have to use an expensive lens to minimize aberration and light degradation across the whole image and find a lens that can capture more than 180° at once. The cheapest and most awkward method is using only a camera on a tripod and shooting bracketed exposure sequences. Problem is, you'll end up with a huge amount of photos that you have to stitch together, and in multiple exposures. Ouch!

There are more options for capturing HDR data from a set, like using special custom-built cameras that can capture both still and animated images, with five exposures at the same time printed on the same frame. Later, using a special program, they can extract the data from each frame and create an HDR image sequence. As far as I know, those are for very specific projects and not for the average day usage. If you want more information in general about HDR photography, you can visit Master Paul Debevec at: www.debevec.org and from there, learn all there is about this great invention.

So, this leaves us with the most tried, trusted, and cost-effective method for creating HDR environment photos; using a camera and a mirror ball. These mirror balls are actually chrome steel balls, mostly used as ball bearings, and come in different sizes. They can be anything between 2 to 20 inches in diameter. Usually, 2 to 10 inch balls have the best possible sphericity and diameter tolerance, thus producing the most distortion-free photos *(As shown in Fig. 3 above)*. They are cheap and can be found in many stores selling ball bearings and similar parts. A famous one is the McMaster-Carr *www.mcmaster.com;* do a search at that page for Ball Bearings. You'll find all the possible sizes available. They ship their products worldwide. Of course, any kind of ball that has reflective properties can be used; Christmas balls, Chinese chime balls, etc. Remember that they have to be clean, without drawings, decals, or colors on them, and they must be as spherical as possible.

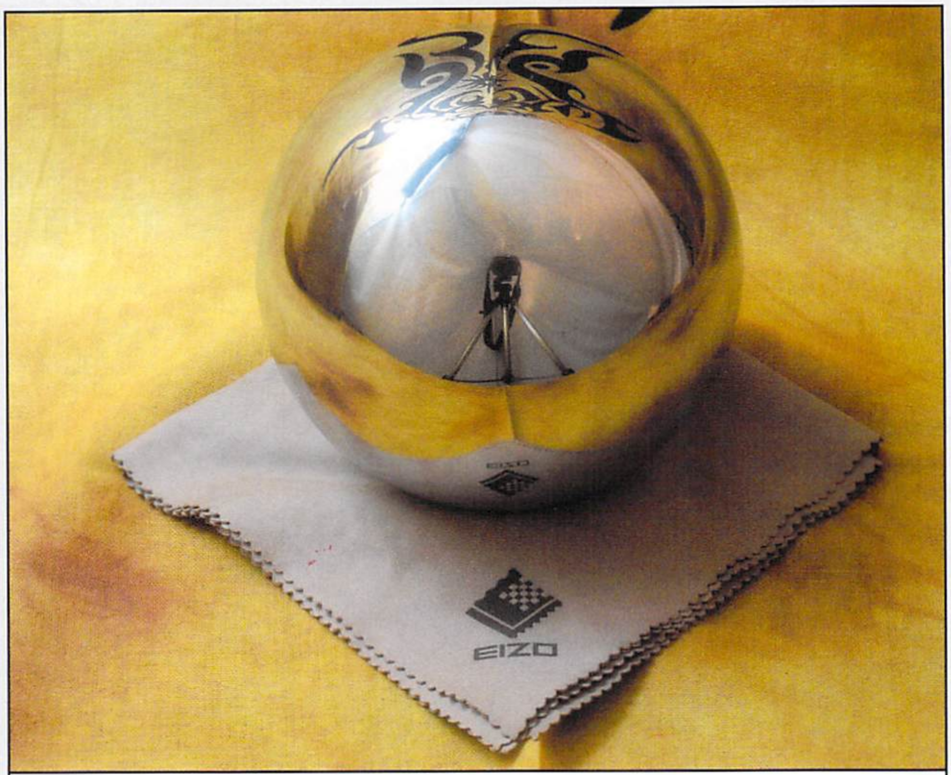


FIG. 2- A 10" CHROME STEEL MIRROR BALL BEARING

This technique has good news and bad news. The good news is that the mirror ball is cheap, can be found anywhere, and can display perfectly at least 320° of the surrounding environment. The bad news is that the camera – and maybe you, the photographer – will be visible inside the reflection of the environment on the ball. Also, we'll get pinched areas in our photo. To fix this, we have to shoot the ball twice, the second time 90° from either side of the original camera position in relation to the ball. This way we'll be able to produce a full 360° panorama, instead of a partial panorama *(See Fig. 4 on next page)* that we would have if we were shooting only one side of the ball. This is useful if you're also going to use the HDR photograph for reflection passes, where the environment will be seen on your 3D model as a reflection. You wouldn't want to see yourself or the camera on that reflection, nor the seam of a partial panorama. But, if you're only shooting for Diffuse or Specular lighting, you can get away with an incomplete panorama, and the camera visible in the photo, as well. In this tutorial, we'll create a full 360° panorama in angular (light probe) and spherical format, and also see how to convert that, or anything else, for Diffuse or Specular usage only, if that's all we need.

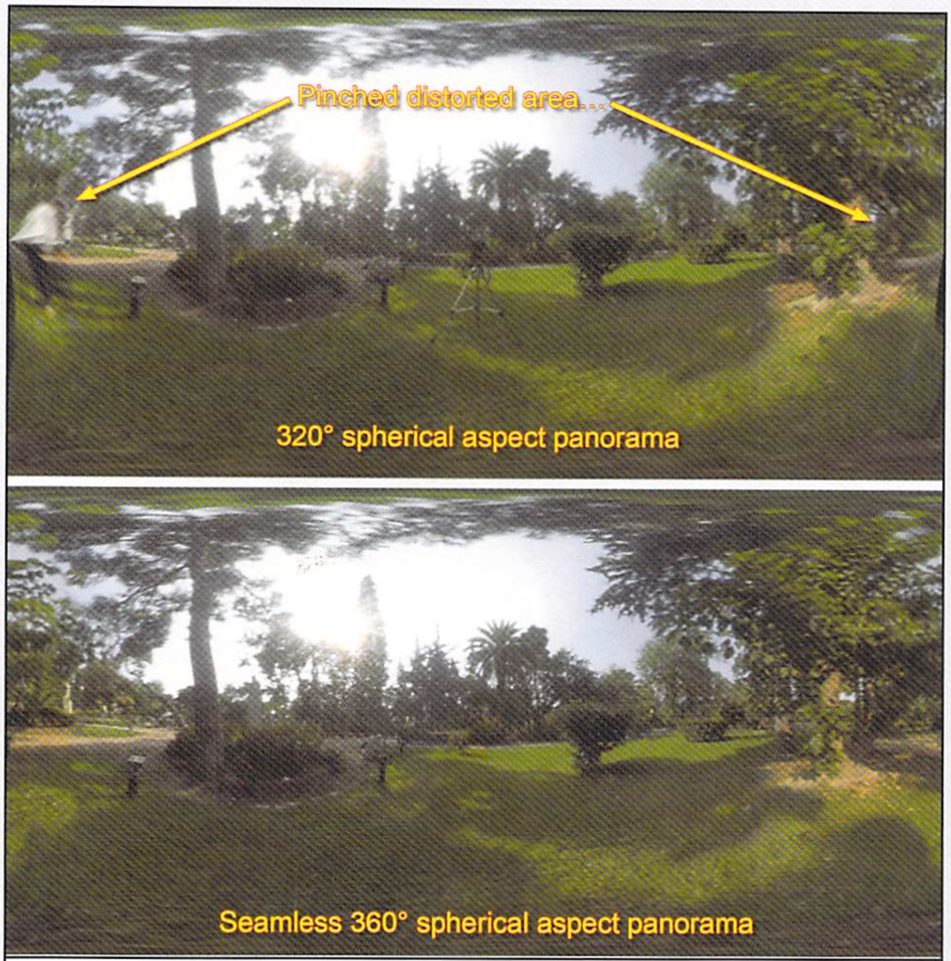

Pinched distorted area...
320° spherical aspect panorama
Seamless 360° spherical aspect panorama

FIG. 3– COMPARING 320° VS. 360° HDR IMAGES

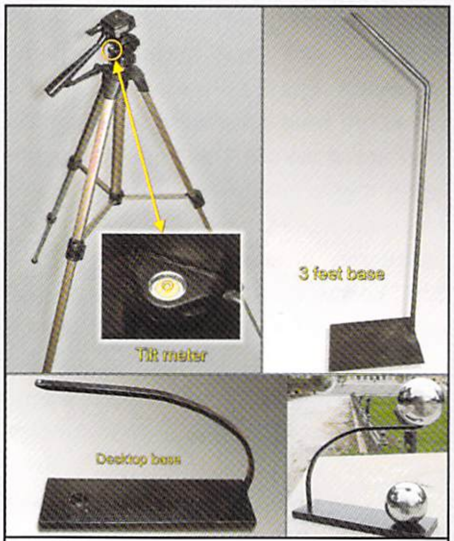


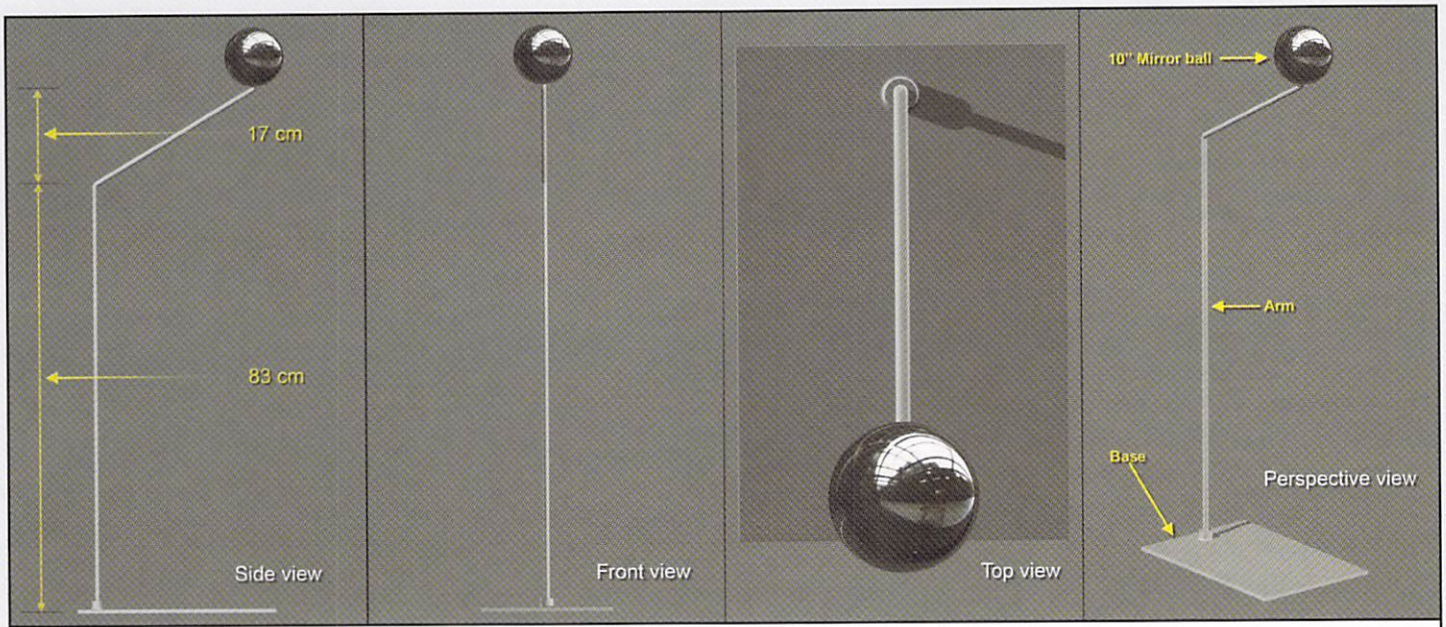
FIG. 4– A CAMERA'S TRIPOD WITH A TILT METER AND TWO HOMEMADE BALL BASES

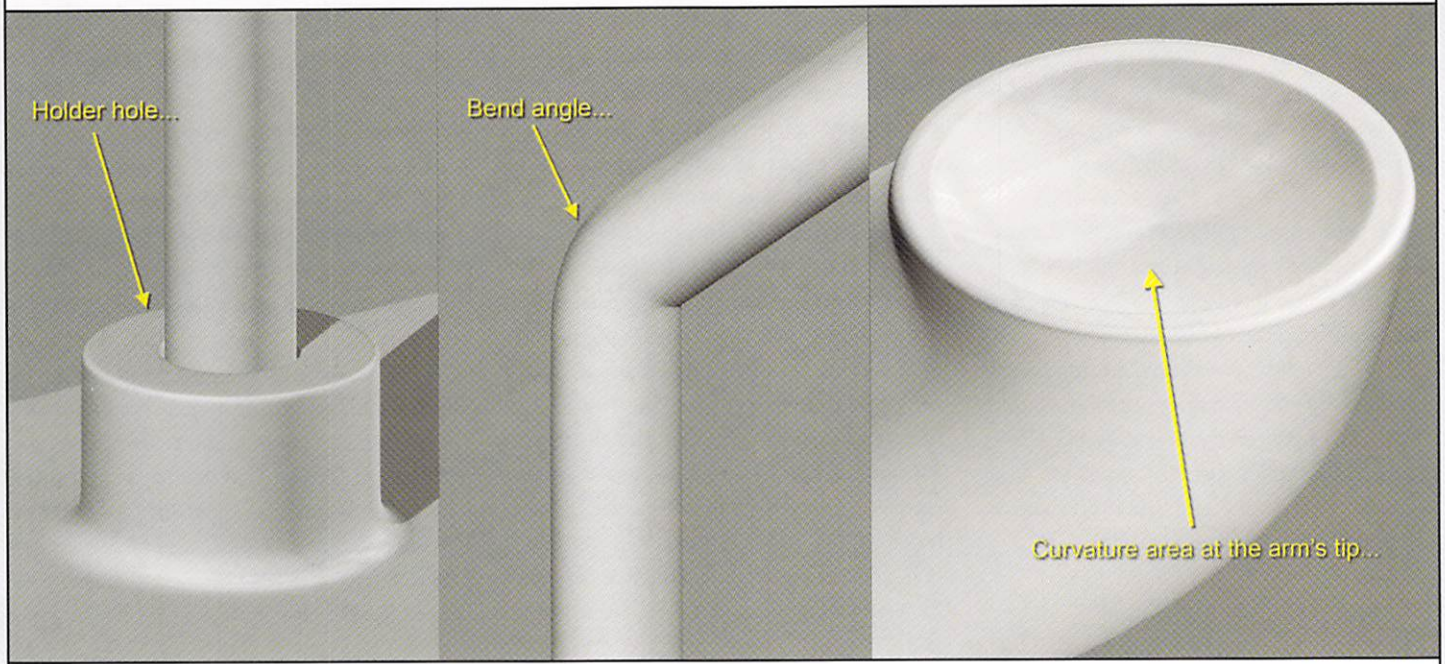
EQUIPMENT

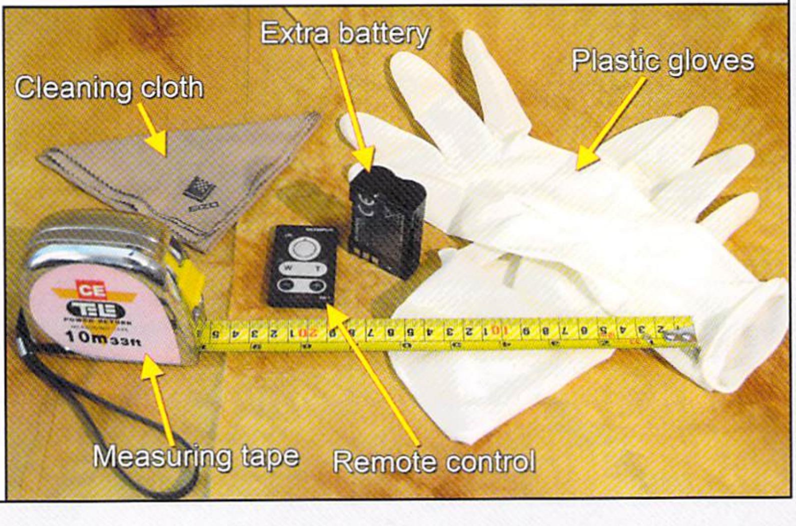
To shoot HDR images with this technique, all we need is a camera, preferably a digital one because they're more forgiving on mistakes, and, of course, a mirror ball. Ideally our mirror ball will be a 5" to 10" chrome steel ball bearing, depending on how much zoom we have on our camera, because the farther away we place it from the ball, the easier it will be to erase it later from the photo. Also, it would be best if we have a steady tripod for the camera and a base for the mirror ball. Without the tripod and the base for the mirror ball, we'll be limited on how to set up our photo session; we definitely have to place the camera on something steady, like a table, and the ball on something that doesn't obscure the area under it, or else we'll get a panorama only from the horizon and above. In Fig. 4, we can see a camera tripod that has a tilt meter (spirit level) and two mirror ball bases, which I created myself with the help of a blacksmith friend. The big one, which is about 3 feet in height, is for full 360° capture. The small one is for environments in which all we want is the upper hemisphere (horizon and above) and we don't care what's below the horizon, like when we want to place a 3D object on a table or product stand.

These bases are constructed easily, especially if you know how to do welding. If you, like me, don't have a clue, you can always visit your local blacksmith and ask him to build one for you. Remember to show him the mirror ball so he can understand its weight, in order to create the proper balance for the base. A common diagram for a base, which is 3 feet in height and could hold a 7 to 10 kilogram mirror ball, can be like the one in Fig. 5 *(Facing Page Top)*. Using a design like this, the ball can properly stand on the base without problems. Also, the arm is curved in such a way as to minimize its presence in the reflection on the ball. The base's sole should weight at least 2/3 of the weight of the ball, and with the extended arm, should equal the ball's weight. If possible, ask him to create a holder hole on the base to fit the arm inside, so you can remove it for easier transportation. Remember to also tell him to create a small curvature at the tip of the base's arm for the ball to sit and balance properly *(as shown in Fig. 6 on facing page)*.

Other things we might need on set when taking photographs (see *Fig. 7* facing page) are a cleaning cloth for the mirror ball, and perhaps a pair of thin plastic gloves, like those used by dentists, so we don't leave fingerprints on the ball's surface. A measuring tape can also be helpful. Remember to fully charge your camera's batteries and take extra batteries with you on set. Also, a remote control for the camera would be nice, in order to minimize the physical interaction with it during the photo session.


17 cm
83 cm
Side view
Front view
Top view
10" Mirror ball
Arm
Base
Perspective view


Holder hole...
Bend angle...
Curvature area at the arm's tip...


Extra battery
Cleaning cloth
Plastic gloves
Measuring tape
Remote control

(TOP) FIG. 5– INTENDED DIAGRAM OF A 3 FEET BASE FOR HOLDING A MIRROR BALL

(CENTER) FIG. 6– HOLDER HOLE TO FIT THE ARM'S BASE. BEND ARM TO MINIMIZE ITS PRESENCE. CREATE A CURVATURE AT THE ARM'S TIP, TO FIRMLY HOLD THE MIRROR BALL

(BOTTOM) FIG. 7– MEASURING TAPE, SMALL CLEANING CLOTH, CAMERA'S REMOTE CONTROL, EXTRA BATTERY, AND PLASTIC GLOVES FOR WHEN ON SET

THINGS TO REMEMBER

The most important thing to remember when shooting an HDR panorama outdoors is to be fast, especially when you're going to shoot from two different angles, as we are, and the light is natural. This means that the time from when we start shooting the ball from the front to the time we finish shooting from the side should be the minimum time possible. That is because if we stall the process somehow, the lighting conditions are likely to change. Clouds may appear and hide the sun, or the opposite. Also, if shooting at a sunrise or sunset, the lighting at that time is rapidly changing. Another thing to remember is that if there are strong winds on location and trees around that area will be seen on the reflection, and eventually in the HDR image, those trees will be blurred, since they would blow in the wind and appear in different poses on each shot we take. So, remember to consult the local weather when you're planning for an outdoor shoot.

NOTE: Capturing a bright sun and sky is tricky and needs careful planning, but, that's beyond the scope of this tutorial and we'll disregard it. You can learn more about this matter, at this Web site: http://www.ict.usc.edu/graphics/skyprobes/. If the lighting on location is artificial, like in a studio environment, we don't care for the above issues and can take all the time we want; at least, the time the production is giving us for the shooting to take place.

Now, in order to create an HDR image, we need multiple Low Dynamic Range (LDR) images. In order to do that, we take simple photographs of the same subject in multiple exposures. A usable number of photos would be anything between 3 to 40 different exposures. Of course, with only three photos, our HDR image would have very limited light range information. On the other hand, with 40 photos, it would be very hard and time consuming to create an HDR image with the HDR Shop. Most digital cameras have the ability to take up to five different exposures automatically when you hold down the capture button. This is called "bracketing exposure." Though it can't capture enough variations of the lighting conditions, it can still be used successfully if we already know the light range our CG model will receive, and we shoot accordingly. For this tutorial, we want to create a rather full HDR image, so 10 to 12 photos of different exposures are all we need for a decent image.

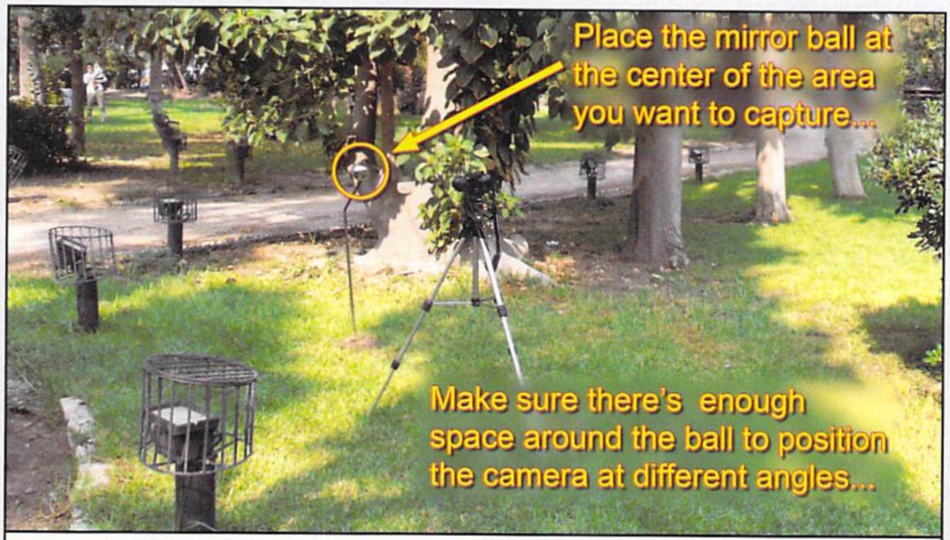

Place the mirror ball at the center of the area you want to capture...
Make sure there's enough space around the ball to position the camera at different angles...

FIG. 8– PLACE THE BALL AND ITS BASE NEAR OR AT THE CENTER OF THE AREA YOU WANT TO CAPTURE. MAKE SURE THERE IS ENOUGH SPACE AROUND THE BALL, FOR THE SECOND 90° SIDE SHOOTING

Speaking of different exposures, we don't necessarily mean taking photos with different diaphragms (F-Stop) each time. Actually, the F-Stop is better set to the highest possible value our camera permits and left there throughout the photo session. That's because at the highest number, we get the best and most clear focus of everything in the scene. Besides, most digital cameras, especially those with built-in lenses, don't have that wide of a range for their diaphragms that we'd like to use for an HDR image. The camera I'm using for this tutorial has the F-8 as the highest possible F-Stop, which is not a good top diaphragm for a camera. If you're using an SLR camera, your lens probably has a much higher F-Stop number; set it there and forget it.

No matter the maximum F-Stop of your camera, there's no problem at all, because we can achieve the different exposures by altering the shutter speed instead. This way we can use speeds from 1/16000 sec to Full Manual Shutter Control and vary them in small in-between increments. Assuming we have all the necessary equipment collected and ready to use, let's go on location and start our HDR shooting session.

SETTING UP ON LOCATION

Once on location, we choose to place our base and mirror ball at the center of where the 3D elements should appear in the final composite, or if that's not possible, at a place near the live shooting where we can capture similar environmental information (see *Fig. 8* above). Now, in theory, the ideal position for the camera would be so far away from the ball that by using an alien-ultra-super-high telephoto lens to frame it, the ball would capture the entire 360° environment at once and with zero perspective distortion. But in practice, this is impossible, not only because there is no such lens, but also because no matter what lens we have, we may not be able to place our camera where we want it, especially if we're shooting indoors. Also, since there is no physical mirror ball that can reflect its surroundings 360°, we have to photograph the ball twice, the second time 90° from the first camera position in relation to the ball. For that, we have to make sure there is enough space around the ball to place our tripod with the camera as shown in *Fig. 8*. After we place the mirror ball's base at the most ideal spot, carefully use the gloves to position the ball on to the base. Use the cleaning cloth to remove any dust or oily fingerprints. Then, place the tripod and the camera in front of the ball; at first, position the lens at the exact same height as the ball; use the measuring tape to find it. Also, use the tilt meter to make sure it's level with the horizon.

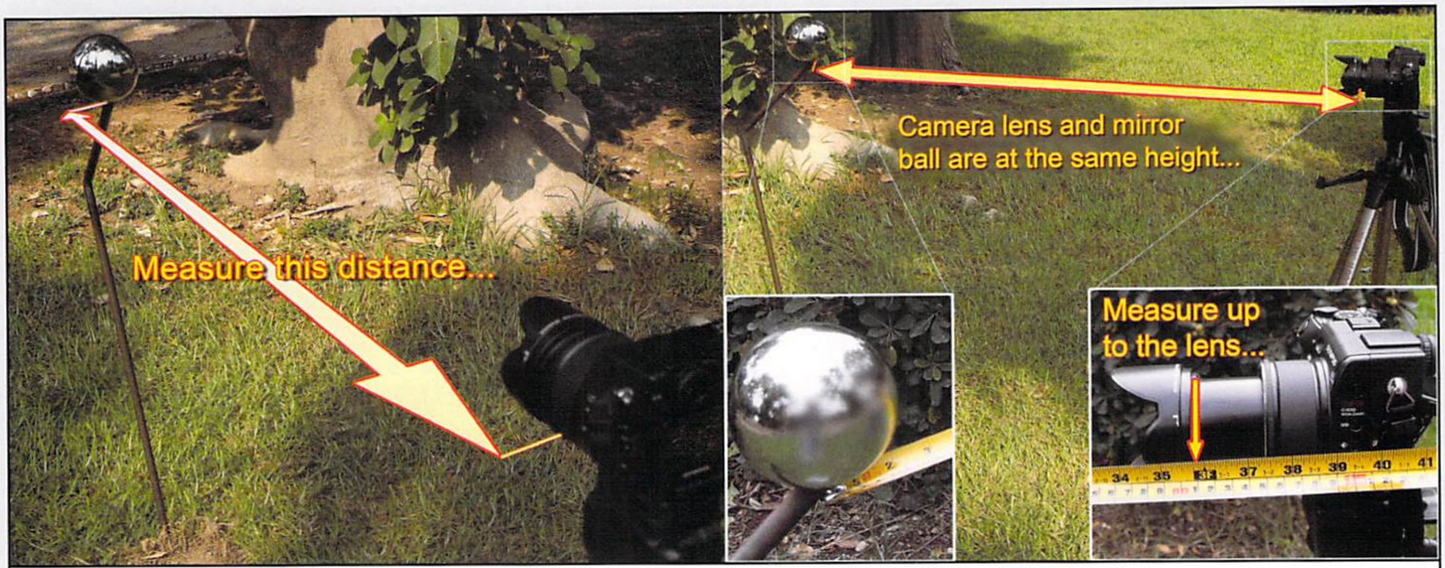

Measure this distance...
Camera lens and mirror ball are at the same height...
Measure up to the lens...
34 35 36 37 38 39 40 41

FIG. 9– TAKE NOTICE OF THE DISTANCE BETWEEN THE LENS AND THE MIRROR BALL. THE CAMERA LENS AND THE MIRROR BALL ARE AT THE SAME HEIGHT FOR THE SECOND 90° SIDE SHOOTING

Now, the distance to place the camera from the ball depends on the camera's mega-pixels (MP) and its lens, the size of the ball, and, of course, the area. If you have a good zoom lens, place the camera as far away from the ball as the surrounding area permits, but try to keep the ball filled with at least half of your frame. Don't go too far or the ball will be very small inside the frame and we'll waste much needed pixel resolution, and don't go too close or we'll get less reflected surrounding area on the ball, plus we'll end up with a huge camera on the HDR environment image that could be hard to erase afterwards. Taking consideration for all the above, we position our tripod in front of the mirror ball. Then, using the measuring tape, we notice the distance between the camera lens and the mirror ball, as shown in *Fig. 9*. Measure the distance from the lens to the lower end of the mirror ball as it sits on the tip of its base. We'll use that distance to properly position our tripod and camera 90° to the side of the ball, so that we get framing as similar as possible from our second time, shooting from the side. For this tutorial, that distance was 91 cm.

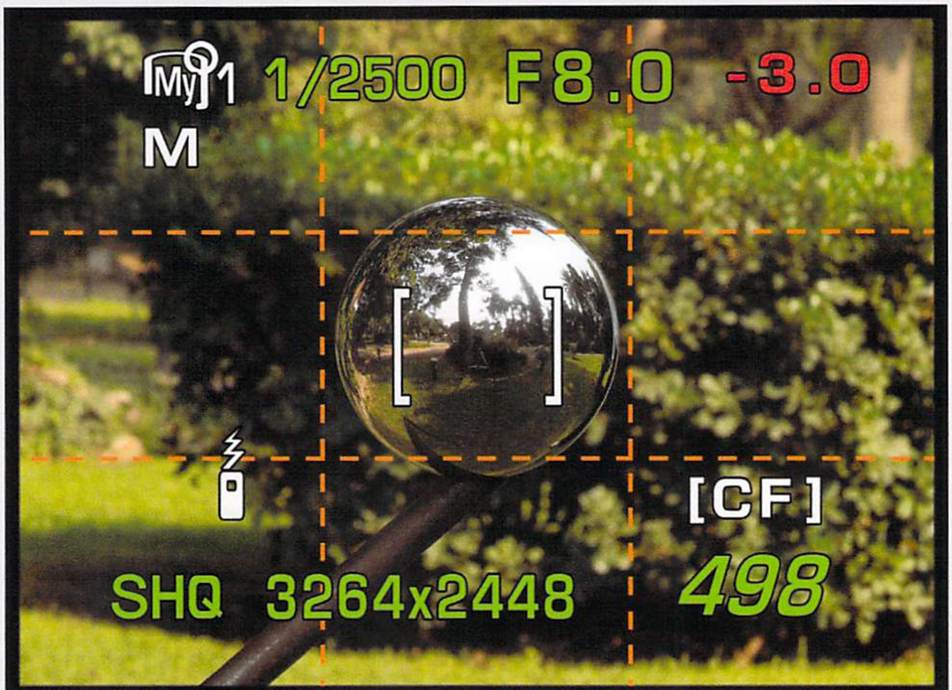


FIG. 10– THE FRAMED MIRROR BALL AS SEEN FROM INSIDE THE CAMERA'S LCD VIEWFINDER

To capture the LDR images, I'm using an 8.3 MP Olympus C8080WZ digital camera, which has 3264x2448 pixel size. Practically, for an HDR panorama that will be used for Diffuse and Reflection lighting on a CG element, 1500x750 in Spherical Aspect Ratio is good enough. We can use any digital camera with 4 MP and above, though by using a camera with lots of pixels, we have the advantage of "wasting" the extra pixels by placing our camera farther away from the ball and framing it in a way that the usable remaining pixels are about 1500x1500 for the ball. This way, when building the HDR image, it's easier to erase the camera. *Fig. 10* shows the framing of the ball, as seen from the camera's LCD viewfinder. If your camera can show aiding guides on the viewfinder, use them for easier framing and make a note of how you frame the ball when shooting from the front to match that framing later, from the side view.

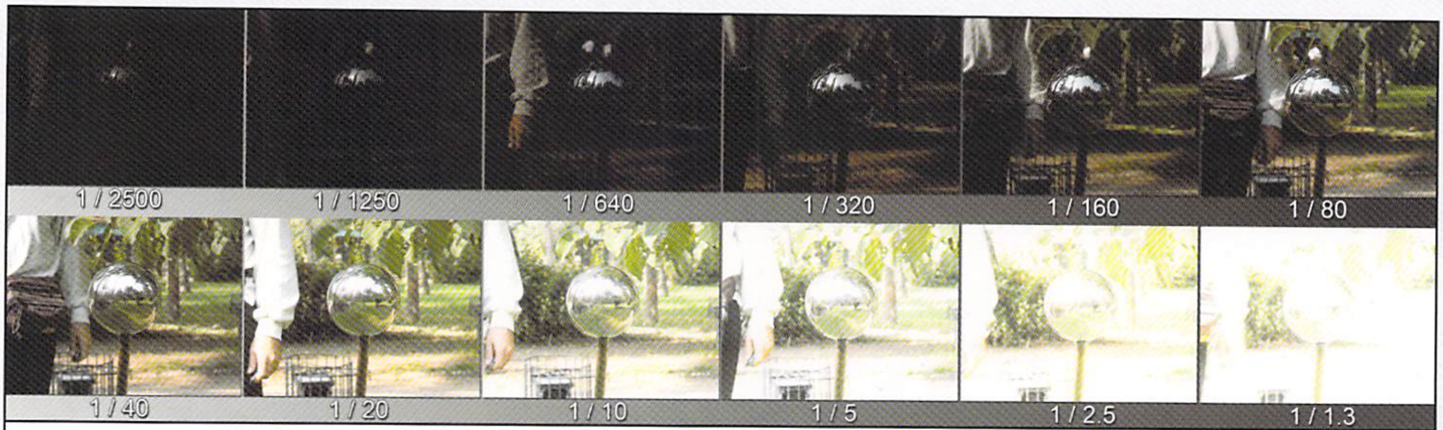


FIG. 11– THE 12 EXPOSURES FROM THE FRONT VIEW OF THE BALL WITH THE EQUIVALENT SHUTTER SPEEDS

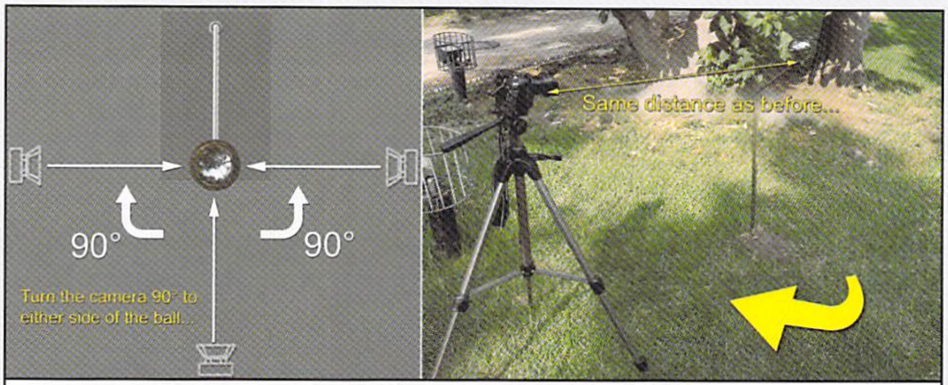

90°
90°
Turn the camera 90° to either side of the ball...
Same distance as before...

FIG. 12– REPOSITION THE CAMERA 90° TO EITHER SIDE OF THE BALL, FOR THE SECOND TIME SHOOTING

SHOOTING THE BALL

On location, we have nice weather with scattered clouds and a bright sun. Fortunately the winds were low. Nevertheless, we'll do the shooting at a fast pace. First, by quick trial and error tests, we determine our highest and lowest shutter speed numbers. We shoot pictures with various shutter speeds, in order to figure out what our Min and Max settings will be. For this shooting, 1/2500 sec is the fastest and 1/1.3 sec the slowest time the shutter remains open. So, working from fastest to slowest, we start our shooting from the front side of the ball. Since we want 12 exposures, the in-between increments for the shutter speed are the following:

Photo 01: 1/2500 (fastest shutter speed)
Photo 02: 1/1250
Photo 03: 1/640
Photo 04: 1/320
Photo 05: 1/160
Photo 06: 1/80
Photo 07: 1/40
Photo 08: 1/20
Photo 09: 1/10
Photo 10: 1/5
Photo 11: 1/2
Photo 12: 1/1.3 (slowest shutter speed)

As you'll notice, we walked our way down the speeds by dividing each setting in half until we reached the slowest setting. This works fine for our case, and in most cases; also, it's an easy way to remember the in-between settings for when shooting from the side view later. In general, we should make a note on paper of the speed settings we'll use, because they must be identical for both the front and side views of the shooting.

Your best bet for not moving the camera during shooting as you change the shutter speed, and also for taking the photo, is to use the remote control for it. This is because each different photo of the ball has to be exactly on top of the other, or else blurring and ghosting will be seen in the final HDR image. But, fear not! This is not a critical factor, as later we'll use Photoshop to correct the different photos to match one another exactly. Needless to say, if you accidentally move the tripod somehow, you'll have to start the shooting of that side over again from the beginning. In *Fig. 11*, you can see the 12 exposures of the ball's front view and the according shutter speed increments. Though I'm standing behind the ball almost 5 feet away, it catches my reflection as well. I should have gone farther away or hidden behind a near tree. Not a big deal; we can erase ourselves from the reflection the same way we'll erase the camera.

As soon as we finish shooting the ball from the front, we relocate the camera and the tripod to 90° on either side of the ball *(see Fig. 12)*. We'll use the distance from the ball we measured before to properly position the tripod and use the LCD viewfinder to frame it from the side, the same way we had it from the front view. Then, we repeat the same process as before and capture 12 shots with the exact same shutter speed settings, like those of the front view shooting. Fig. 13 shows the 12 exposures of the ball, this time as they were captured from the side view.

After finishing shooting the ball from the front and side views, and before we pack everything and leave, we have to take a few reference photos of the set. Though this has nothing to do with the making of an HDR image, it will help a whole lot when building the 3D scene for our object; especially for when placing the CG lights. So, take pictures of the set from various locations, making sure you get a snapshot of everything around the ball. If you're in a studio set, make sure you pho-

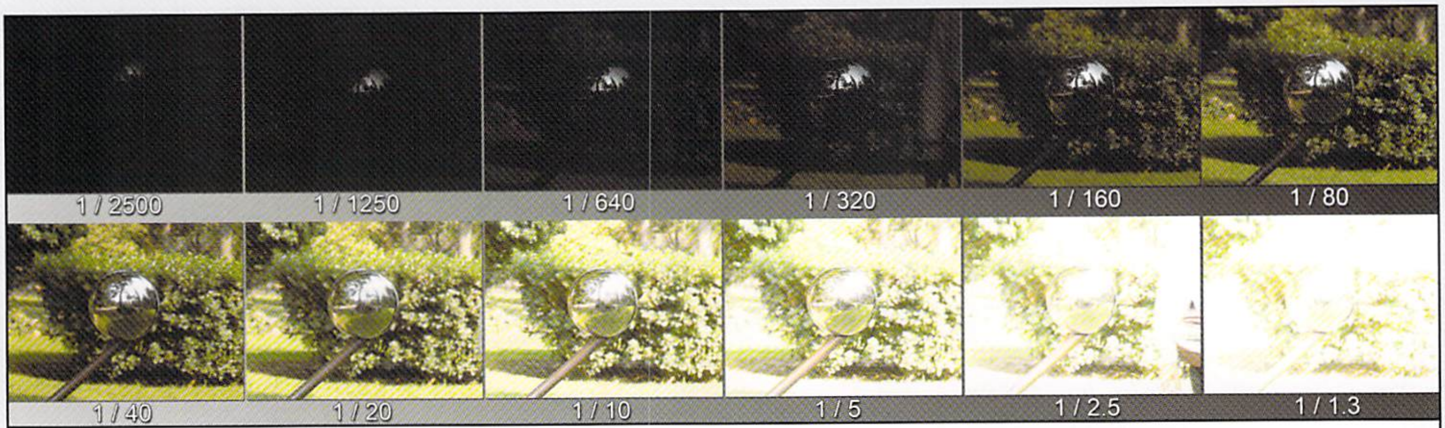
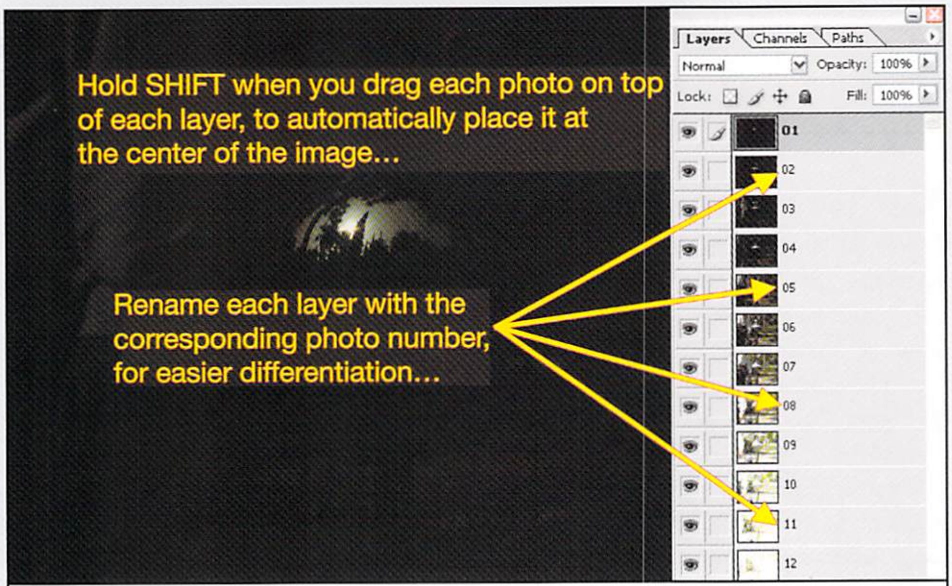


FIG. 13– THE 12 EXPOSURES FROM THE SIDE VIEW OF THE BALL WITH THE EQUIVALENT SHUTTER SPEEDS


Hold SHIFT when you drag each photo on top of each layer, to automatically place it at the center of the image...

Rename each layer with the corresponding photo number, for easier differentiation...

FIG. 14– THE 12 LAYERS OF ALL THE "FRONT" PHOTOS, STACKED ON TOP OF EACH OTHER IN ONE IMAGE

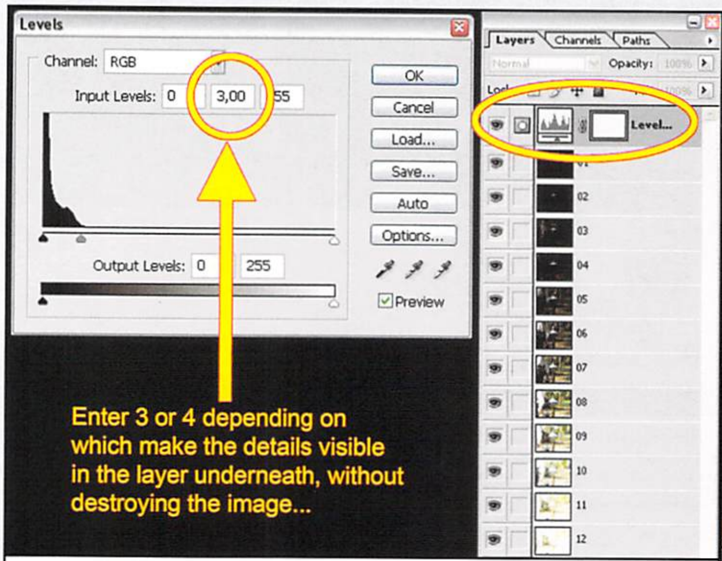
tograph the artificial lighting rigs and also the items, if any, around the area of where the ball was placed. Make a sketch on paper of the position of the artificial lights if the shooting is in a studio set and mark their type and intensity. If it's an outdoor set, make a note of the time of the shooting and the weather. Also, if your 3D object is to be inserted on film or video footage, write down the type of the camera and lens for each different shot. Now, we can call it a wrap and go back to start building the HDR image from all those LDR images we shot.

PREPARING LDR IMAGES

First thing to do is to download all the pictures from the camera to a hard disk. To organize things a bit, we can create three directories: "LDR," "HDR," and "Reference." Inside the "LDR" directory, we create two more directories called "Front" and "Side," in which we place the LDR photos of the ball. Since all the photos get their names automatically from the camera, it can be helpful to rename the "Front" and "Side" photos to something more recognizable, like "Front-01" for the fastest shutter speed photo (1/2500), "Front-02" for the next and so on, up to "Front-12" for the last photo with the slowest shutter speed (1/1.3). The same applies for the "Side" view photos, this time with names like "Side-01" up to "Side-12." In the "Reference" directory, we can put all the reference photos we got from the set and in the "HDR" directory, we will put the images generated from each step we do, until we have our final HDR image.

Now, we'll use Photoshop to make sure that each mirror ball photo is exactly on top of the other, and then cropped to keep only the ball. If we are certain that the camera or the ball wasn't moved at all during the photo session, we can skip this and go directly to HDR Shop and do the cropping there. It's easier to make sure everything is okay with the photos in Photoshop, since we have more tools for editing and cropping images. Besides, most of the time during the photo session, most likely the camera has moved just a bit from shot to shot, especially if we didn't use a remote control.

Open Photoshop and load all the "Front" LDR images. Select the last one, which should be the "Front-12" photo – the brightest and most washed out photo – and double-click the locked background layer to convert it to a working layer; name that layer "12." One by one, and working in reverse order using the Move tool, hold down Shift and left-mouse drag all the other photos into the "Front-12" photo. Hold Shift while dragging to make sure that each image layer is placed automatically at the center. Each time you drop a photo, make sure you rename its layer accordingly to the number. For example, the "Front-11" should be the "11" layer, the "Front-06" should be the "06" layer, and so on. We end up having all 12 photos in distinct layers inside one image, like in Fig. 14. Working in pairs – 01 with 02, 02 with 03, 03 with 04 and so on – we make sure that each layer photo of the ball is at the exact same location as the layer underneath. Examine the layer "07," which is one where all the details on the



Input Levels: 0 3,00 55

Output Levels: 0 255

☑ Preview

Enter 3 or 4 depending on which make the details visible in the layer underneath, without destroying the image...

FIG. 15– ADD A LEVELS ADJUSTMENT LAYER, TO SEE MORE DETAILS OF THE DARK IMAGES

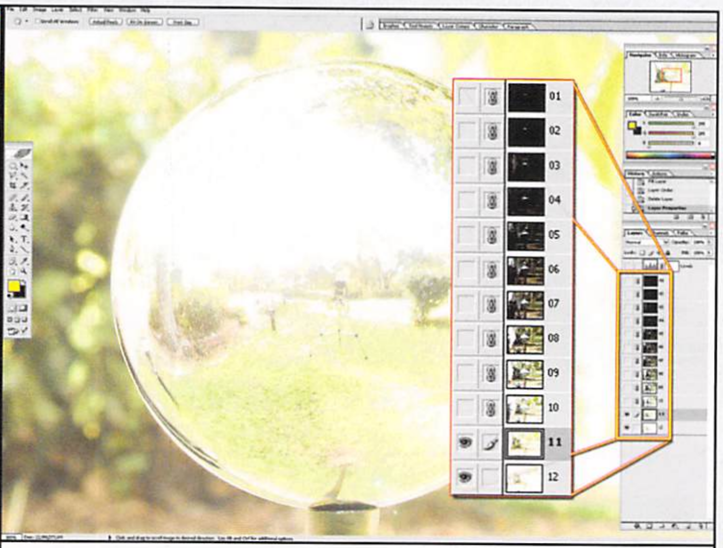
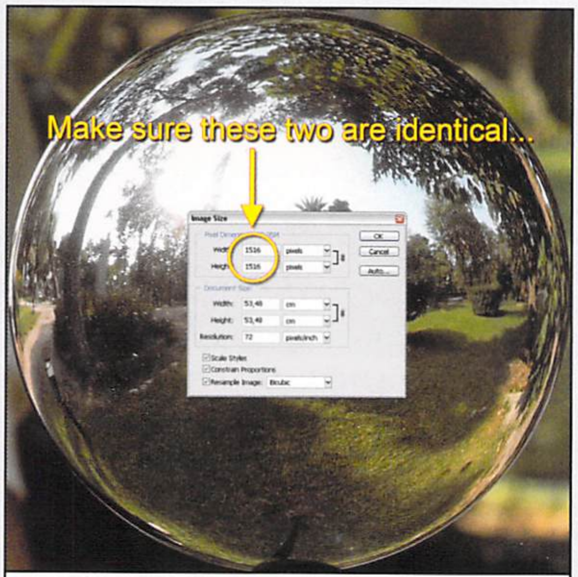


FIG. 16– WORKING IN PAIRS, ALL THE LAYERS HAVE BEEN MOVED EXACTLY ON TOP OF EACH OTHER

reflection on the ball can be perfectly seen. Find a detail that you know wasn't moving in the set, like a tree trunk, a desk, a building, a big rock, or even a mountain. Zoom in to that detail and select the first layer; in our case, the 01 layer. The first four layers are quite dark and the details are hard to see. For that, we'll add on top of the first layer an Adjustment Layer of a Levels tool, to be able to see more of the details of the first layers (as shown in *Fig. 15* above). When we reach layer 05, we can delete the Levels Adjustment Layer, since it's no longer needed. So, with the Levels Adjustment Layer added, we select layer 01 and examine it in regard to layer 02, to see if the first is exactly on top of the second. If it's not, we move it until they are identical. Most of the time, the movement of each layer is only pixels, so we can use the arrow keys for it and at the same time, use the mouse to click on the eye symbol next to layer 01 at the Layers panel to hide-unhide the first layer, each time checking the progress of the move. When we are happy with the first pair of layers, we link them together, and then hide the one we've just moved; in our case, layer 01. Then we repeat the process for the pair 02 and 03 layers. This way, we'll end up having visible only the last two layers: 11 and 12. All the above layers will be hidden and linked together except the last one, and all of them will be identically on top of each other *(Fig. 16)*.

Now it's time to crop the images and keep only the mirror ball. Make layer 07 visible and draw a rectangular marquee selection around the ball, just a bit bigger than the ball's edges. Immediately, place the mouse inside that selection and right-click to select the Transform Selection tool from the popup panel. With that, move each side of the selection independently and position it exactly at the ball's edge. Then hit Enter to keep the changes to the selection, and select Crop from the Image dropdown menu. Normally, the resulting image should be a perfect square rectangle. We can check this by choosing Image Size from the Image dropdown menu and noting the width and height in pixels. If they are not the same, undo the last two steps and repeat the Transform Selection process, moving accordingly the vertical or horizontal edges of the rectangle selection, until the cropped image is a perfect square *(Fig. 17)*. While checking the width and height of the image at the Image Size panel, if it's square, resize it down to something more meaningful. For this tutorial, 1000x1000 pixels are good enough.

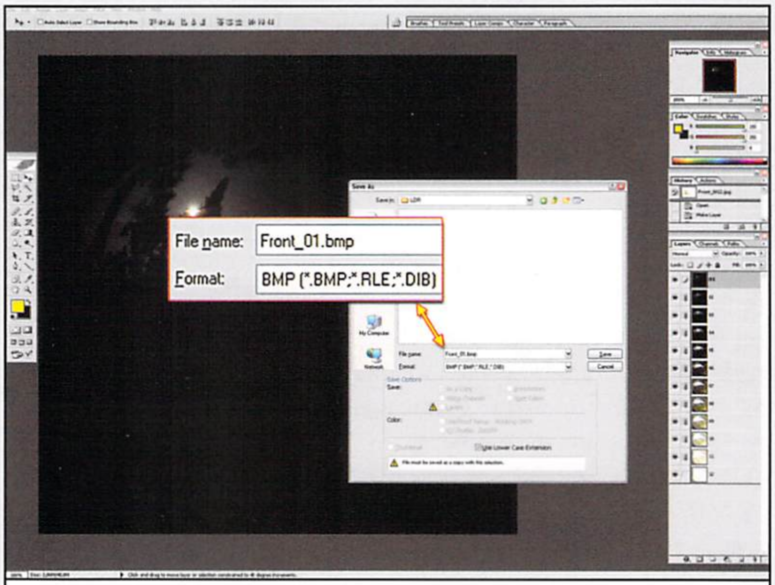


Make sure these two are identical...

Width: 1516 pixels
Height: 1516 pixels
Width: 53,48 cm
Height: 53,48 cm
Resolution: 72 pixels/inch
☑ Scale Styles
☑ Constrain Proportions
☑ Resample Image: Bicubic

FIG. 17– USE THE IMAGE SIZE PANEL TO CHECK IF THE CROPPED IMAGE IS A PERFECT SQUARE

Last thing to do is save each layer as a distinct file image in a format that HDR Shop can recognize, like BMP or TIFF. We can do this by selecting one layer at a time and pressing "Ctrl+Shift+S," which is the equivalent to the "Save As" command. For layer 01, we should use a name like "Front_01," for layer 02 a name like "Front_02," etc. (see *Fig. 18* facing page). We work our way down from layer 01 to 12, and every time we select to save another layer, we hide the last one. Don't forget to choose the appropriate format each time you save a layer, as it reverts to PSD by default. We'll end up with 12 BMP or TIFF images of our mirror ball from the front view in 1K square resolution. That's all we had to do for the "Front" view images of the ball. We have to repeat the exact same process for the "Side" view photographs *(Fig. 19)*. When we finish with them, we can go to HDR Shop to build our HDR image from the newly cropped images we've just created.



File name: Front_01.bmp

Format: BMP (*.BMP;*.RLE;*.DIB)

FIG. 18– SAVE EACH LAYER INDEPENDENTLY AS A BMP OR TIFF FILE

BUILDING AN HDR IMAGE

HDR Shop version 1 is a free downloaded application that can create and edit HDR images. You can download it at: http://www.ict.usc.edu/graphics/HDRShop/download/ Version 2 is also available with tons of new features, but it's not free. For building HDR images though, version 1 is more than enough. Let's open HDR Shop and at the top menu buttons, click on Create and select the "Assemble HDR Image from LDR Sequence." A rather large panel pops up. First thing to do is load our LDR cropped images we've just saved from Photoshop. Click on the Load Images button and a file requester will pop up; multi-select our entire set of "Front" cropped images *(Fig. 20)*.

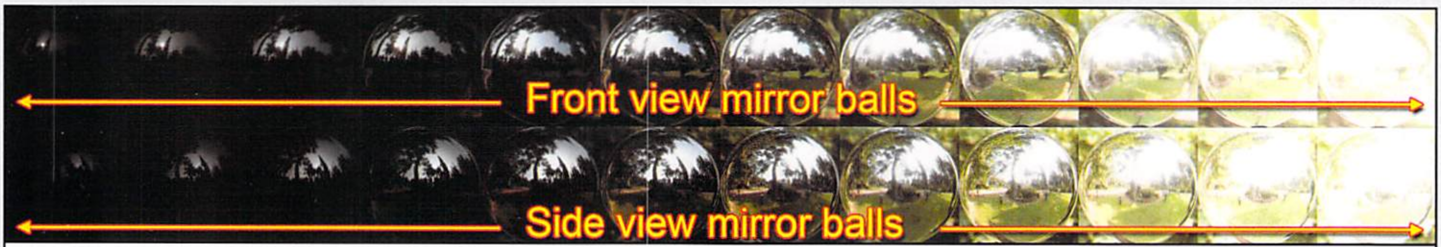
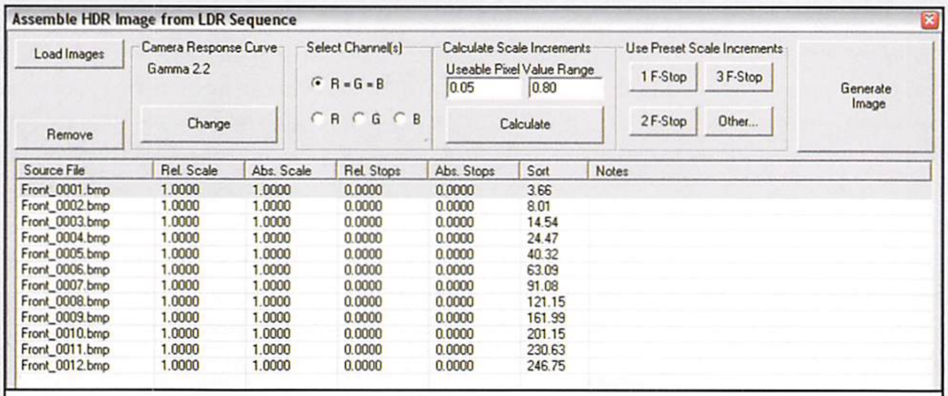


FIG. 19– ALL THE EXPOSURES OF THE MIRROR BALL FROM "FRONT" AND "SIDE" VIEW



Camera Response Curve: Gamma 2.2

Select Channel(s): ● R = G = B ○ R ○ G ○ B

Useable Pixel Value Range: 0.05 0.80

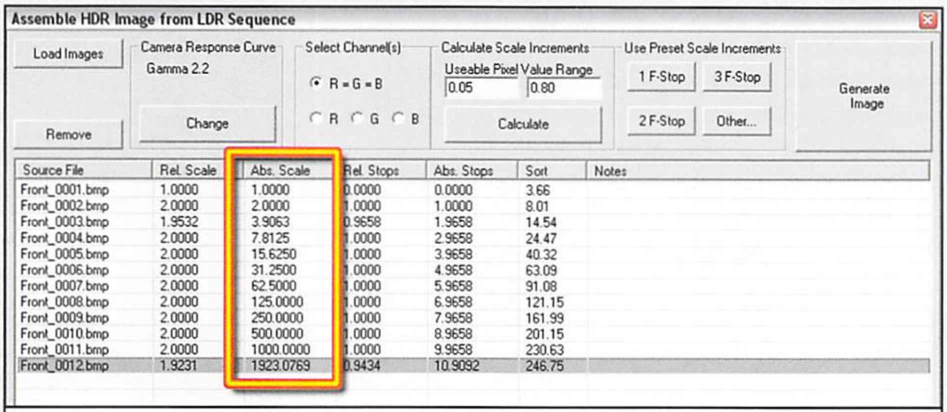
Source File	Rel. Scale	Abs. Scale	Rel. Stops	Abs. Stops	Sort	Notes
Front_0001.bmp	1.0000	1.0000	0.0000	0.0000	3.66	
Front_0002.bmp	1.0000	1.0000	0.0000	0.0000	8.01	
Front_0003.bmp	1.0000	1.0000	0.0000	0.0000	14.54	
Front_0004.bmp	1.0000	1.0000	0.0000	0.0000	24.47	
Front_0005.bmp	1.0000	1.0000	0.0000	0.0000	40.32	
Front_0006.bmp	1.0000	1.0000	0.0000	0.0000	63.09	
Front_0007.bmp	1.0000	1.0000	0.0000	0.0000	91.08	
Front_0008.bmp	1.0000	1.0000	0.0000	0.0000	121.15	
Front_0009.bmp	1.0000	1.0000	0.0000	0.0000	161.99	
Front_0010.bmp	1.0000	1.0000	0.0000	0.0000	201.15	
Front_0011.bmp	1.0000	1.0000	0.0000	0.0000	230.63	
Front_0012.bmp	1.0000	1.0000	0.0000	0.0000	246.75	

FIG. 20– THE "ASSEMBLE HDR IMAGE FROM LDR SEQUENCE" PANEL WITH THE "FRONT" PHOTOS LOADED

Now, we could finish quickly if we used the Preset Scale Increments by clicking on the "1 F-Stop" button, then on the "Generate Image" button, to create the "Front" view HDR image, but this may not work for all cases. We have to do this the right way, which is to manually input the different F-Stop settings of each photo independently. However, we didn't use incremental F-Stops for the different exposures when we were shooting and instead used incremental shutter speeds. How can we input those speeds, or how can we convert them to F-Stops, since there is a clear F-stop (Abs. Stops) field we could use?

There is an easy way to do exactly that. We'll use the Absolute Scale field (Abs. Scale), instead of the Abs. Stops, to enter numbers produced with the following formula. We divide the fastest shutter speed number with each and every one of the other speeds, starting from itself, which gives us the Absolute Scale of 1. Then, we divide it with the next speed number, which is 1/1250. This would be 1/2500 / 1/1250, which gives us 2. This number is our second input for the Abs. Scale field. Obviously, we can forget about the fractions and work directly with the denominators. We do the same for the third shutter speed setting in the row, which is the 1/640, and the formula would be 2500/640 = 3.9063. This is our third input number for the Abs. Scale field, for our third photo in the row. We do the same for all the shutter speed numbers and we get the following:

FORMULA	ABSOLUTE SCALE
2500/2500	1
2500/1250	2
2500/640	3.9063
2500/320	7.8125
2500/160	15.625
2500/80	31.25
2500/40	62.5
2500/20	125
2500/10	250
2500/5	500
2500/2.5	1000
2500/1.3	1923.0769



Assemble HDR Image from LDR Sequence

Camera Response Curve: Gamma 2.2

Select Channel(s): ● R = G = B ○ R ○ G ○ B

Calculate Scale Increments — Useable Pixel Value Range: 0.05 0.80

Use Preset Scale Increments

Source File	Rel. Scale	Abs. Scale	Rel. Stops	Abs. Stops	Sort	Notes
Front_0001.bmp	1.0000	1.0000	0.0000	0.0000	3.66	
Front_0002.bmp	2.0000	2.0000	1.0000	1.0000	8.01	
Front_0003.bmp	1.9532	3.9063	0.9658	1.9658	14.54	
Front_0004.bmp	2.0000	7.8125	1.0000	2.9658	24.47	
Front_0005.bmp	2.0000	15.6250	1.0000	3.9658	40.32	
Front_0006.bmp	2.0000	31.2500	1.0000	4.9658	63.09	
Front_0007.bmp	2.0000	62.5000	1.0000	5.9658	91.08	
Front_0008.bmp	2.0000	125.0000	1.0000	6.9658	121.15	
Front_0009.bmp	2.0000	250.0000	1.0000	7.9658	161.99	
Front_0010.bmp	2.0000	500.0000	1.0000	8.9658	201.15	
Front_0011.bmp	2.0000	1000.0000	1.0000	9.9658	230.63	
Front_0012.bmp	1.9231	1923.0769	0.9434	10.9092	246.75	

FIG. 21– ALL THE ABSOLUTE SCALE NUMBERS ARE INSERTED FROM TOP TO BOTTOM, STARTING FROM 1

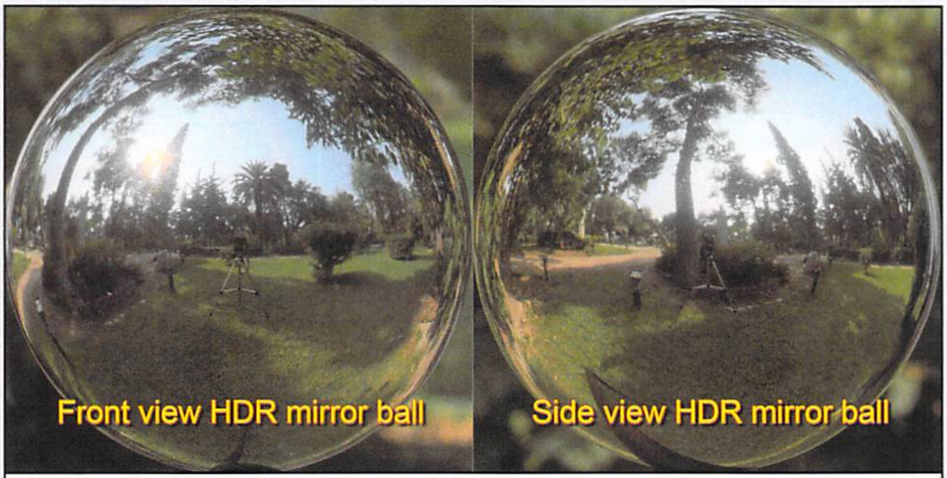


FIG. 22– OUR FIRST HDR IMAGES FROM THE "FRONT" AND "SIDE" VIEW OF THE MIRROR BALL PHOTOGRAPHS

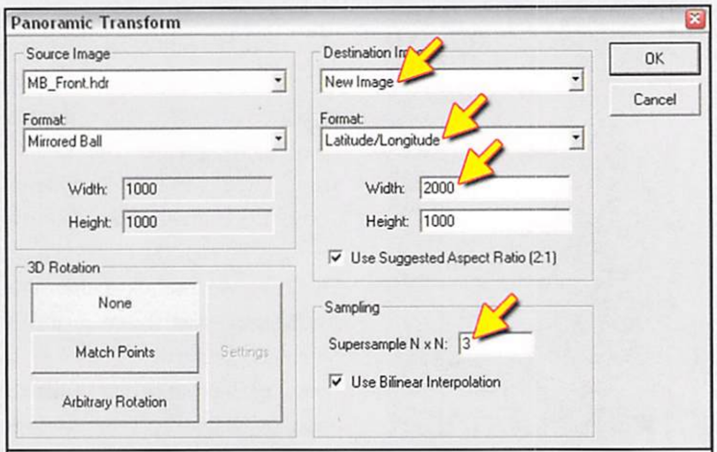
This formula is actually based on the fact that every double increase in the shutter's speed also increases the exposure (F-Stop) by two. Kudos goes to Richard Annema (rannema@splutterfish.com), director of Client Relations in SplutterFish LLC, for the clearance on this matter, among many other things as well. The resulting numbers are to be inserted in the Absolute Scale field from top to bottom, like in *Fig. 21*, starting from number 1 and descending. This is how we convert the shutter speed settings we used for our photographs into something HDR Shop can work with and recognize. By filling the Abs Scale fields, HDR shop automatically calculates the Absolute Stops values accordingly for our photographs.

We should leave the Gamma Response Curve at the default value of 2.2, which is the default value for most digital cameras and photographs. When we fill all the numbers of the Abs. Scale fields, we can click on the "Generate Image" button. After a few seconds we get our first HDR mirror ball image. Save it in the "HDR" directory we created in the beginning and use the Radiance (*.HDR) format with the name "MB_Front"; MB stands for Mirror Ball. We repeat the exact same process with the exact same numbers for the "Side" view images and we name the resulting HDR image "MB_Side" *(Fig. 22)*.

EDITING HDR IMAGES

The purpose of shooting the "Side" view was to fill in the bad sampling area (pinching distortions) of the "Front" view in order to complete the 360° panorama, and to erase the camera from the center of the image. For that, we choose "Front" as our primary image and "Side" as our secondary image, meaning that we'll use the "Side" image to fill in the missing parts of the "Front," which will be our main image for the whole panorama. After all, one HDR image is all we want to create. This is not necessarily a rule to follow; I've chosen the "Front" image as the primary image for the panorama, since the Sun looks more interesting in it than in the "Side"; it could have easily been the opposite arrangement.

At this point, we can convert the two mirror ball HDR images we've created into a format more meaningful to our brain and eyes, like the Latitude/Longitude format, which maps (converts) the horizontal and vertical dimensions into latitude and longitude coordinates, like on a globe. We can do that by selecting each image one at a time, and from the top menu under Image – Panorama, we choose the Panoramic Transformation tool. A new window pops up, where we can see a "Source Image"



Source Image: MB_Front.hdr
Format: Mirrored Ball
Width: 1000
Height: 1000

Destination Image: New Image
Format: Latitude/Longitude
Width: 2000
Height: 1000
☑ Use Suggested Aspect Ratio (2:1)

Sampling
Supersample N x N: 3
☑ Use Bilinear Interpolation

FIG. 23– THE PANORAMIC TRANSFORMATION TOOL SETTINGS FOR CONVERTING THE MIRROR BALLS

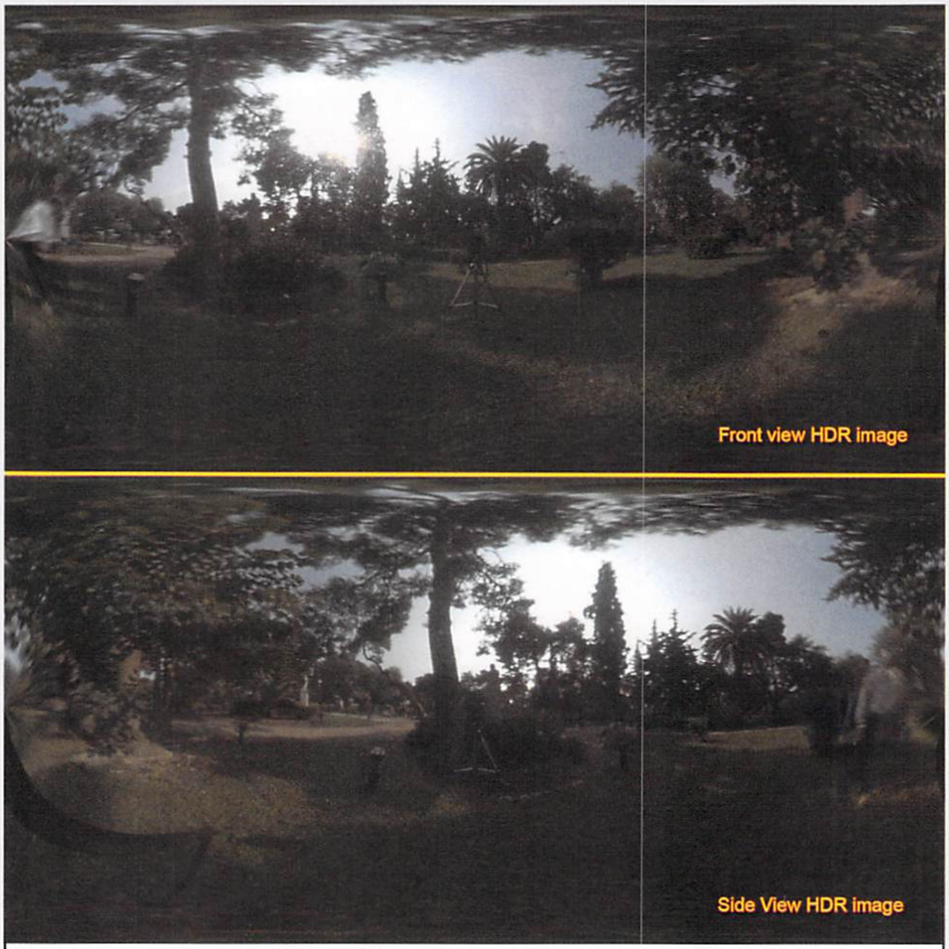


FIG. 24– THE FRONT AND SIDE VIEW IMAGES AFTER WE SCALED UP THE F-STOP EXPOSURE VALUES

and a "Destination Image" area. By default, the last selected image before we activate that tool is the one at the Source Image field and the default-selected format is the Mirror Ball, which is what our source image is anyway. On the Destination Image, we should always leave the New Image option activated to minimize accidents, since HDR Shop doesn't have a working Undo function. Now, in the format field of the Destination Image, we'll choose the format to which we wish to convert our mirror ball. That would be the Latitude/Longitude. Below, we can set a width and height for the destination image. Since, our source image is square with a 1:1 aspect ratio, converting it to this format would get a 2:1 aspect. Normally, we'd want to keep the detail of our image intact. For that, we can keep the same height and double the width, because we can rescale down to the original size anytime without losing resolution from the image, instead of rescaling up, which would blur the details of an image. So, we set 2000x1000 for the width and height, accordingly. Use Suggested Aspect Ratio (2:1) should be checked. The Sampling value is a method of anti-aliasing the transformation process. The bigger the number here, the more time it takes to complete the process. Actually, values more than 5 don't bring any visual difference to the image. A suggested value for the supersample field for all transformations is 3. When done setting the fields, hit the OK button to convert the mirror ball to a Latitude/Longitude format *(Fig. 23)*. Follow the same process for both the "Front" and "Side" HDR mirror balls. Save the newly created HDR images with the names "LL_Front" and "LL_Side" accordingly; LL stands for Latitude/Longitude. Close the two mirror ball images, since we no longer need them.

Now it's a good time to scale up our current exposure to a brighter default value so we can see our HDR images better. We press the numeric "+" button four times on each of the two images to up the exposure stops four times. We can check it by noticing the lower right corner, where it displays the current F-Stop number. After that, we can select from the top menu under Image and Pixels the "Scale to Current Exposure" function, or press Ctrl+0, which is the equivalent shortcut key. Notice that at the lower right corner it now says 0 F-Stops. By doing this, we don't lose any exposure information; it's just for viewing purposes. We do the same for both "Front" and "Side" images. Then, we save them again to keep them at this exposure *(Fig. 24)*.

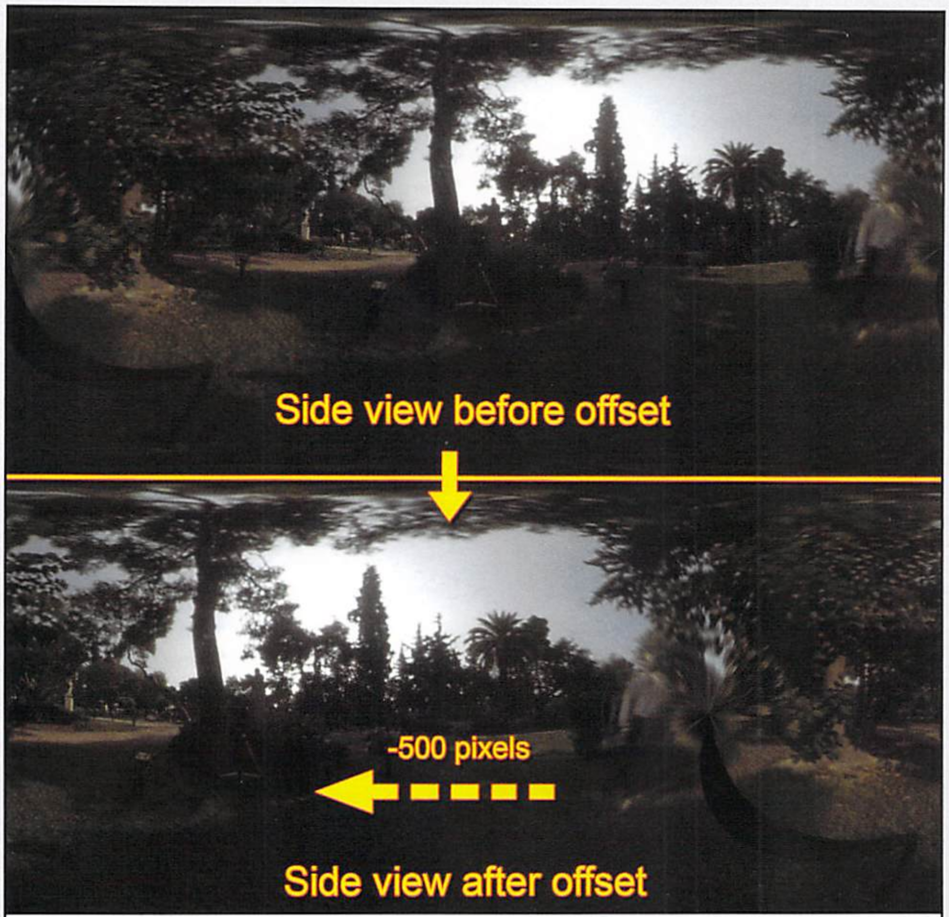
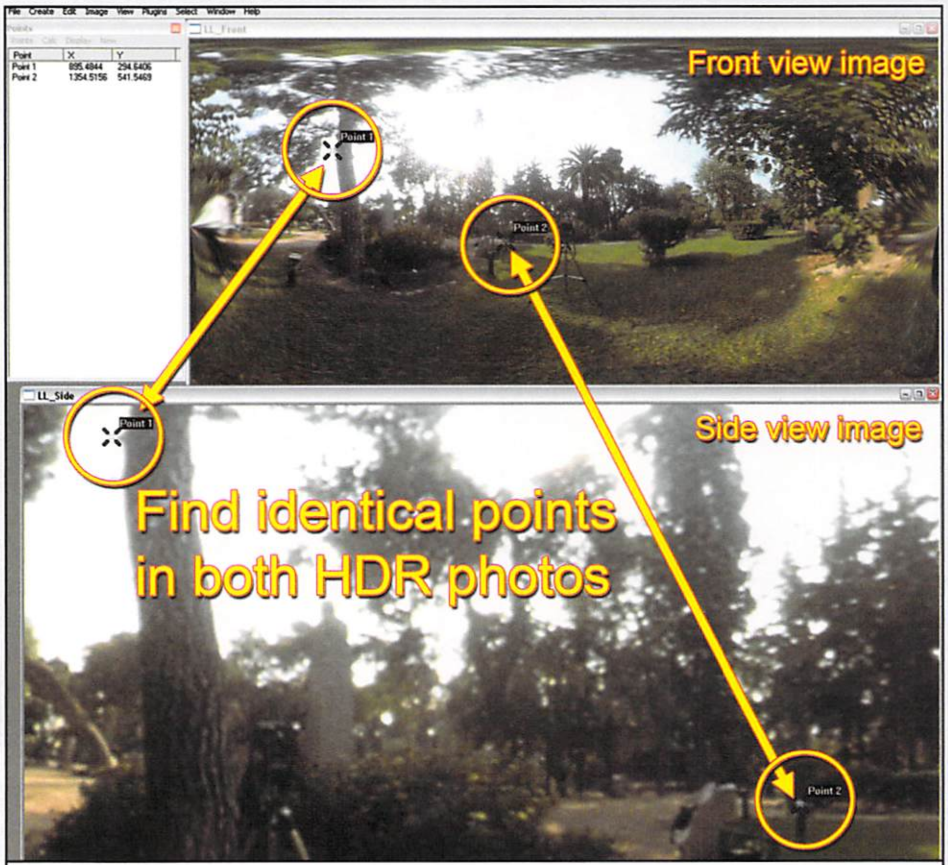


FIG. 25– BEFORE AND AFTER THE OFFSET OF THE "SIDE" VIEW IMAGE


File Create Edit Image View Plugins Select Window Help
Points
LL_Front
LL_Side
Front view image
Side view image
Point 1
Point 2
Find identical points in both HDR photos

Point	X	Y
Point 1	895.4844	294.6406
Point 2	1354.5156	541.5469

FIG. 26– LAYOUT SETUP IN HDR SHOP FOR POINT EDITOR; IDENTICAL POINTS ARE SELECTED

It's easier now to see that the two images are similar but not identical, since they are 90° apart. We have to rotate the "Side" image to exactly match the "Front" image, in order to blend them together. The rotate term is used here, since we're in a spherical Latitude/ Longitude format. There are two ways to do this; the easy way and the accurate way. The easy way requires that when shooting the ball, the two shooting angles, front and side, are perfectly parallel to the horizon, meaning that the height of the camera when shooting was exactly the same for both and that the camera was parallel to the ground. If that's the case, then we can simply offset the "Side" image to match the "Front." How much offset should we use? Well, we position the camera at a 90° difference between the two shootings, which is one quadrant of a full 360° panorama. For that, we offset the "Side" image by its whole width; for our case, -500 pixels. The offset has a negative sign, because the camera for the "Side" view shooting was set to the left side of the ball. If it were set to the right side, then it would be a positive offset. So, we do the offset using the Image, Transform, "Shift w/Wrap" tool and set -500 in the width field *(Fig. 25)*.

Now, the two images are almost perfectly aligned, but there is a small difference in the parallax perspective. That's because the distance from the ball to the camera lens was not exactly the same between the Front and Side view shoots. Probably, we could fix this with a Perspective Correction tool, but nothing like that is available for HDR Shop at this point. So, there's not much we can do about it, but most of the time the difference is negligible, especially if we paid as much attention as possible when setting the correct distance between the camera and the ball during the shooting session.

That was the easy way. The accurate way is finding two identical points in the two images and using them to rotate one image in all rotational axes to match the other. This is more accurate, because it rotates the image in X-Y-Z space instead of just horizontal or vertical, as with the easy way. In order to use this way, first we have to revert the "Side" view image to its original un-offset state and work with the Point Editor in HDR Shop, which is located at the top menu bar under Window. Then, holding Ctrl down, we can click on an image and add point locators and see their X-Y coordinates on the image at the Point Editor panel. For this to work, first we have to locate an item that is clearly visible in both images and zoom in at almost a pixel level for clear and better identification. Then, with Ctrl + left-click, we add one point in one image at that location we've chosen and another one in the other image at the exact same location. We need two points per image for this to work, and it's better to select points from different areas of the image that are separate enough from each other (see *Fig. 26*, previous page). The identical locations we choose should not include the camera, of course, nor small trees, leaves, or anything that might be in different location from one image to the other. Ideal candidate points can be artificial lights, big rocks, windows, furniture, thick poles, or even mountaintops. The two points in each image have their own X-Y coordinates, which we have to write down on paper or in a notepad, because we'll need them shortly. The following table shows the coordinates for our images and how we should write them down:

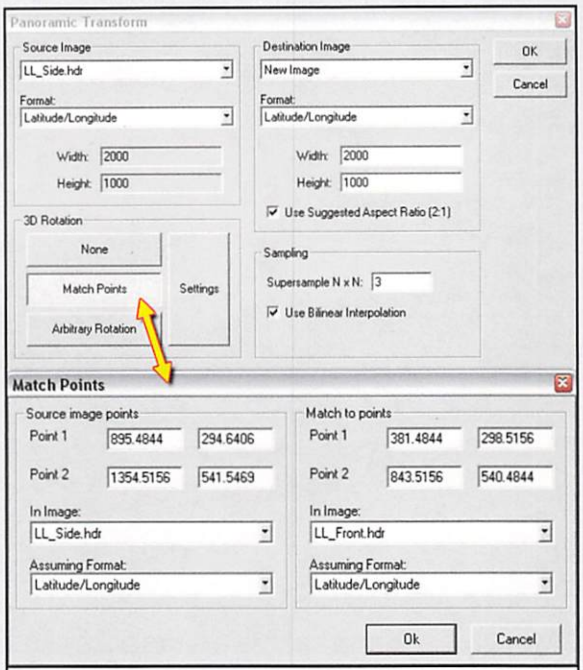
Front image points coordinates:

	X	Y
Point 1	381.4844	298.5156
Point 2	843.5156	540.4844

Side image points coordinates:

	X	Y
Point 1	895.4844	294.6406
Point 2	1354.5156	541.5469

To perform the rotation, we select the "Side" image, and under Image in Panorama, we choose the Panoramic Transformations tool. Then we set as the Source Image the "LL_Side" image in Latitude/Longitude format, and the same for the Destination Image, but for a New Image. We can set a super-sample number of 3, and then we select the Match Points button and click on the Settings button to enter its properties. There we input the coordinates we've written down from the two pair of points. The source image is the "Side" view image. We want to match its points with those from the "Front" view image. Set up everything, like in Fig. 27, click on OK to close these properties, then OK to execute the rotation. This way, a new "Side" view image will be created and rotated to match the "Front" image. Now, the "Front" and "Side" images should be as similar as possible. We could fine-tune the match between the two pictures more by using the Panoramic Transformations tool and doing Arbitrary Rotations on the "Side" view using small values, and on one axis at a time. A lot of trial and error can go on for this process, so it's up to you to judge if that's necessary, since it's dependant on how accurate the selection of the points was and how similar the distance was between the camera and the ball during the shooting of the two sides. For this tutorial, we leave the "Side" view rotated through the accurate method and tweak it no more. Save it in HDR format using a different name; something like "LL_Side2" will do.



Source Image: LL_Side.hdr
Format: Latitude/Longitude
Width: 2000
Height: 1000

Destination Image: New Image
Format: Latitude/Longitude
Width: 2000
Height: 1000
☑ Use Suggested Aspect Ratio (2:1)

Sampling
Supersample N x N: 3
☑ Use Bilinear Interpolation

Source image points
Point 1: 895.4844 294.6406
Point 2: 1354.5156 541.5469
In Image: LL_Side.hdr
Assuming Format: Latitude/Longitude

Match to points
Point 1: 381.4844 298.5156
Point 2: 843.5156 540.4844
In Image: LL_Front.hdr
Assuming Format: Latitude/Longitude

FIG. 27– PANORAMIC TRANSFORMATION AND MATCH POINTS SETTINGS, FOR MATCHING "SIDE" VIEW TO "FRONT" VIEW IMAGE

MASKS IN PHOTOSHOP

Now, it's time to blend the two images to remove the pinched areas and the camera and to create a seamless panorama. We'll use Photoshop to create a black and white image to use as a mask for the blending, which will happen in HDR Shop. To do that, first we will have to save an LDR image from each of our two "Front" and "Side" view images. Select one image at a time; up the exposure two F-Stops to better see details and select File, Save as … from the top menu. This time, save the image as a Low Dynamic Image and in a format Photoshop can read; I used Windows BMP. Use a name like "Preview_Front" and "Preview_Side" for the two images and in the popup window, select Yes to save the images using current viewing settings. Load these two images in Photoshop and Shift+drag the "Preview_Front" image on top of the "Preview_Side" image. We can unlock the background layer and rename it to "Side" and also, rename layer 1 to "Front" in order to more easily understand which image is which. Add a Layer Mask to the Front layer and select it *(Fig. 28)*. Now, select the Brush tool, and using a black color, start painting over the camera and the pinched area of the Front layer to erase those areas and reveal the Side layer underneath. Set a white color for a background color, so you

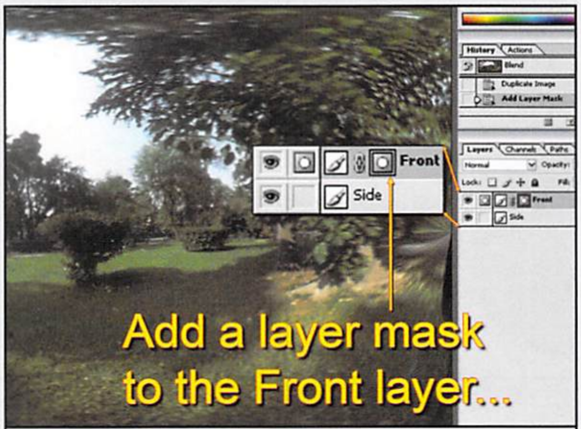


FIG. 28– POSITION THE "FRONT" VIEW OVER THE "SIDE" VIEW LAYER AND ADD A LAYER MASK TO PAINT ON

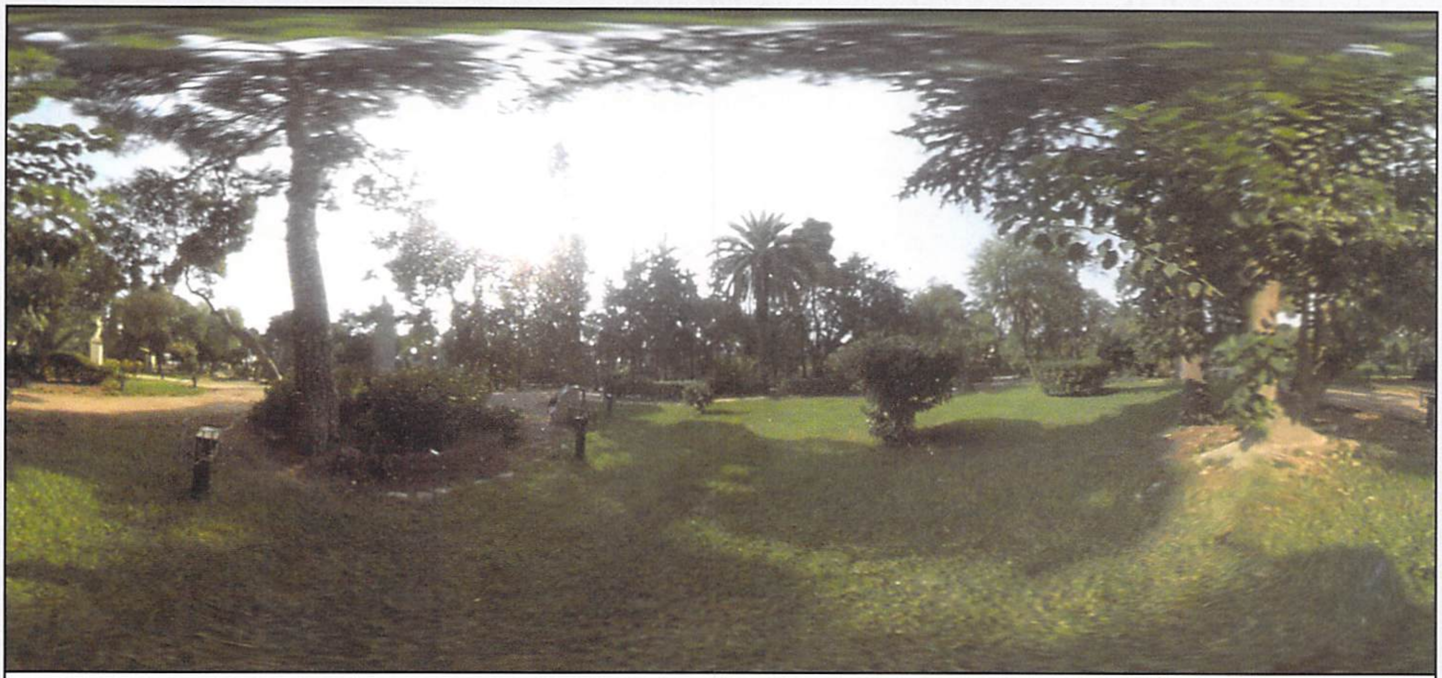


FIG. 29– BOTH "FRONT" AND "SIDE" VIEWS SEAMLESSLY BLENDED IN PHOTOSHOP, USING A MASK. PINCHED AREAS AND CAMERA ARE NO LONGER VISIBLE

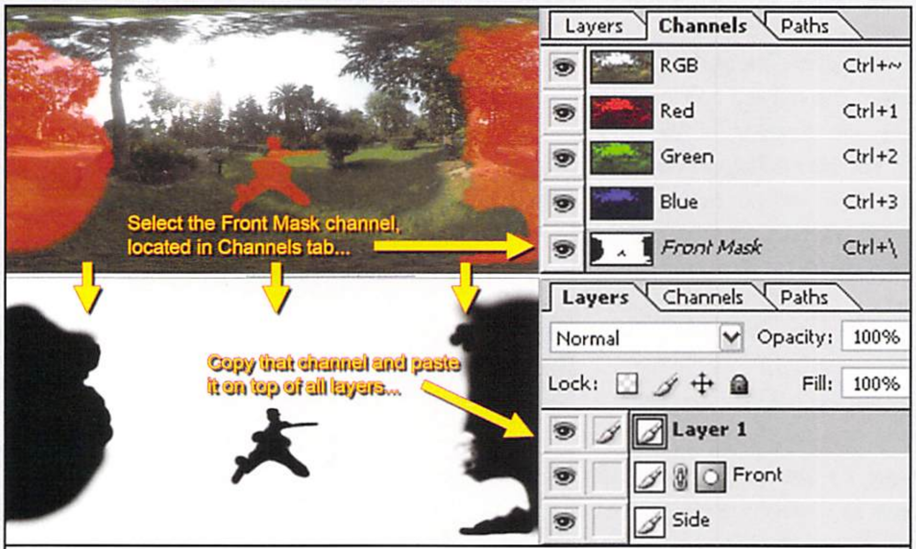
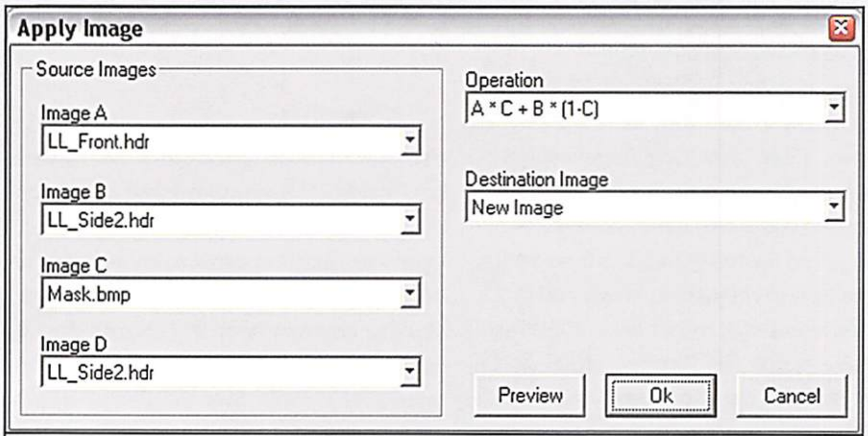

Select the Front Mask channel, located in Channels tab...
Copy that channel and paste it on top of all layers...
Layers
Channels
Paths
RGB Ctrl+~
Red Ctrl+1
Green Ctrl+2
Blue Ctrl+3
Front Mask Ctrl+\
Normal
Opacity: 100%
Lock:
Fill: 100%
Layer 1
Front
Side

FIG. 30– PRESS "CTRL+A" TO SELECT THE FRONT MASK CHANNEL AND PASTE IT ON TOP OF ALL LAYERS, THEN FLATTEN THE IMAGE



Apply Image

Source Images

Image A: LL_Front.hdr

Image B: LL_Side2.hdr

Image C: Mask.bmp

Image D: LL_Side2.hdr

Operation: A * C + B * (1-C)

Destination Image: New Image

Preview
Ok
Cancel

FIG. 31– THE CALCULATE FUNCTION PANEL WITH THE APPROPRIATE SETTINGS FOR THE BLENDING OF THE TWO HDR IMAGES

can use it to paint on the mask layer to reveal the Front layer, if necessary. By pressing the X shortcut button, we can easily switch between the foreground and background colors. Continue painting on the mask layer using various brush sizes until you completely remove the camera and the pinched areas, until all you see is a "cleaned" image *(Fig. 29)*. Now, select the Front Mask layer and copy-paste it on top of all the layers *(Fig. 30)*. Then, flatten the image and save it as a Windows BMP or TIFF file; use the name "Mask."

CREATING THE FINAL HDR IMAGE

Back in HDR Shop, load the "Mask," along with the "LL_Front" and "LL_Side2" images. We'll use the "Calculate" function, located at the top menu under the Image tab, to blend the two HDR images using the "Mask" image. We activate the function and a panel pops up. Set the following settings: Image A is the "Front" view image, Images B and D are the "Side" view, and Image C is the "Mask." The Destination Image should be a new one, as usual, and the default operation that will do the blending is the: A * C + B * (1-C) *(Fig. 31)*. Hit OK and voilá! We get a new HDR image out of the two previous images, cleaned of bad sampling areas and the camera. If we're pleased with the result, we can convert this

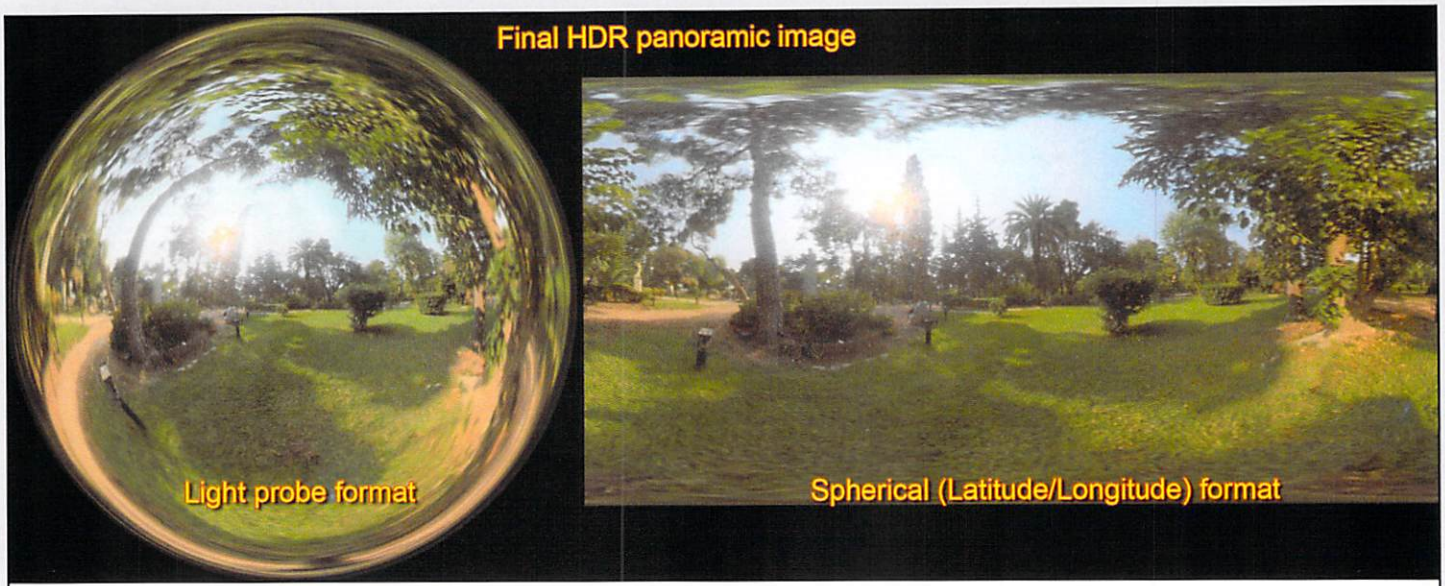

Final HDR panoramic image
Light probe format
Spherical (Latitude/Longitude) format

FIG. 32– THE FINAL HDR IMAGE, IN TWO DIFFERENT FORMATS; LIGHT PROBE AND LATITUDE/LONGITUDE

new image, in probe (angular map) format through the Panoramic Transformations tool. Remember to set the resolution at 1000x1000 pixels, since that was the default mirror ball image size we used. If the spherical (Latitude/Longitude) map is all we want for our HDR image, we can keep this new HDR image as it is now and probably rescale it down to 1500x750 pixels *(Fig. 32).*

BEYOND THIS TUTORIAL

Most of the time, our final HDR image up to this point will be okay. But, there may be times where further editing should be applied, probably because of a bad or wrong setup on set during the photo session. With Photoshop, we can't edit HDR images directly at their full 96-bit depth, and HDR Shop has no paint capabilities, but we still might need to fix certain areas of the image.

So, we need other applications with paint, edit, and clone stamp capabilities for HDR images. My personal favorite is the Idruna Software Photogenics HDR program (http://www.idruna.com/downloadwindows.html). It is not free, but if you're serious about HDR editing, I strongly suggest buying it. With it, we can use its Clone Stamp tool to retouch areas on our HDR images that the blending with a mask in HDR Shop did not fix, or simply paint in full 96-bit depth. There is a 30-day full feature trial version available for

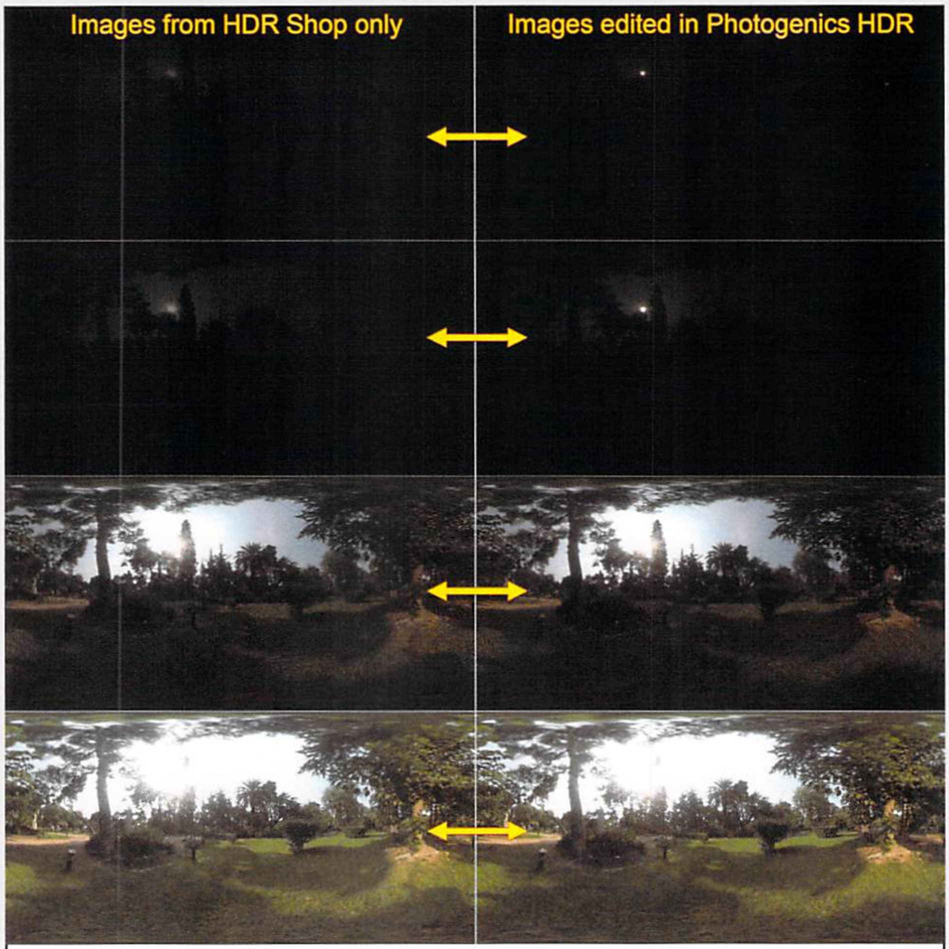


FIG. 33– COMPARISON OF VARIOUS F-STOPS BETWEEN HDR SHOP AND PHOTOGENICS

download. A neat feature is the ability to "go" down in low F-Stop values of our HDR image – way lower than we could capture on set during a photo session – and re-paint lights to give them brighter intensities. Also, we can use masks created in Photoshop to isolate certain areas on our HDR images, like entire skies, and apply effects on them like blurring or direct color painting. I used Photogenics to further edit our final HDR image; in Fig. 33 *(Previous Page)*, we can see and compare the results. I've added a brighter Sun in lower F-Stop values, blurred the sky a bit and clone-stamp painted over areas that had some bad sampling still visible.

FINAL THOUGHTS

As far as I know, HDR Shop is not available for OSX yet. Alternative software for OSX is "Photosphere" (http://www.anyhere.com/). Also, "Cinepaint" is a free multi-platform program that can paint in full 96-bit depth (http://cinepaint.sourceforge.net/).

This tutorial was one of the many ways for creating High Dynamic Range panoramic images. These images can be used in most 3D rendering applications available today for Image-based Lighting, in order to generate more realistic renderings of CG models. I hope you enjoy this tutorial as much I enjoyed creating it. For those of you who want to experiment, the LDR cropped version of "Front" and "Side" view photos of the ball are available online at HDRI 3D magazine's Resource page, in a single 36MB zip file. Thanks for reading, and see you next time …

GREGORY GLEZAKOS (AKA "T.REX" TO HIS FRIENDS) IS AN EXPERIENCED 3D ARTIST WORKING PROFESSIONALLY FOR THE LAST 10 YEARS, EITHER AS A FREELANCER OR CONTRACTED TO MAJOR DOMESTIC PRODUCTION STUDIOS. WHEN BETWEEN JOBS, HE IS TEACHING LIGHTWAVE AND DIGITAL FUSION, EITHER TO STUDENTS OR BY HELPING ARTISTS IN VARIOUS VISUAL FX HOUSES MEET THEIR DEADLINES.

INTERNET LINKS

Here are some helpful Internet links about HDRI in general:

MOST WANTED SITE:
Paul Debevec's site:
http://www.debevec.org/

MIRROR BALLS AND BALL BEARINGS:
http://www.outdoordecor.com/cgi-local/SoftCart.exe/online-store/scstore/c-GazingGlobes.html?L+scstore+ctjj4861ff5b365b+1099260072
http://www.dube.com/ball/8.html
http://engineeronline.ws/elmes/spheres.htm

HDRI PROGRAMS:
HDR Shop:
http://www.ict.usc.edu/graphics/HDRShop/
Idruna Software Photogenics HDR:
http://www.idruna.com/downloadwindows.html
Cinepaint:
http://cinepaint.sourceforge.net/

HDRI RELATED TUTORIALS:
HDR Shop Tutorials:
http://www.ict.usc.edu/graphics/HDRShop/main-pages/tutorials.html
CG Techniques:
http://www.cgtechniques.com/tutorials.php
Mirror Ball Distortions:
http://www.pointzero.nl/dump/mirrorball_theory/
High Dynamic Range Image Encodings:
http://www.anyhere.com/gward/hdrenc/hdr_encodings.html

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Lighting the way for digital artists

BY WILL MENDEZ

MODELING A CROSSBOW WITH XSI

In this tutorial, we will be modeling a Crossbow using Softimage|XSI v4.0, utilizing a variety of XSI's excellent modeling toolsets.

Before we begin, we want to enable the headlight display in the camera's viewport. (Viewport b) We will do this by single-clicking on the word Wireframe, then selecting Display Options. When the Property Page opens, scroll to the bottom and click on the square next to Enable Headlight. You can now close the Property Page by clicking on the X in the Property Page window. This will enable us to view the shadowed parts of the object. You can now single-click on the word Wireframe (in the camera view) and hit the S key to switch to Shaded mode. I will split my view up between the camera view, user view, and the right view, but you can use a quad view if you like.

OK, now let's begin by going to the Model Panel (shortcut key 1) and clicking on *Get >Primitive>Polygon Mesh >Cube.* Enter 4 in U, 1 in V, and 4 in Base. Now, select the second to first polygon *(as shown in Figure 1)* using Raycast mode (U key), and right-click select Extrude Along Axis. (Note: If you do not get a context menu when right-clicking, you probably have *Extended Component Selection* enabled in the Master Control Panel; if so, click on Select in the Master Control Panel and uncheck *Extended Component Selection)* Enter 10 for the Length value, as well as for the Subdivs value. Click on the Transform tab, single-click on the green divot next to X, hold the left mouse button down, and drag the divot into the Z divot. What this does is create an expression. You can close the Expression Editor Property Page and enter .1 in X; you will notice that the Z value will change as well. If you are getting a pinching effect, you will want to uncheck Transform Per Subdivision. Now enter -120 in Rotation X, then in Translation, enter 10 for X and Y. (You can use the previous expression method here as well if you like.) Enter 30 for Z, and hit Shift + A to center the object in all viewports. You should now have something that resembles Figure 2.

The face of the extruded polygon should still be selected. Hit Shift + Z, hold down the left mouse button, and drag a region around the tip of the bow. Right-click on it and select Extrude along the axis again, Enter 3 for Subdivisions and 1.9 for Length, click on the Transform tab, and enter 60 for Rotation on X. Hold down the CTRL key and select the polygon face next to the tip we just rotated. *(Figure3)* Right-click select Bridge Polygons, close the Property Page, and center the object in all views (Shift+A). Switch your Right viewport to the top view and hit the Y key for Polygon Selection mode. Select the left half of the original cube object *(Figure4)* and hit Delete. Hit the spacebar, then in the Model panel, click on *Modify>Poly.* Mesh and select Symmetrize Polygons. Hit the A key to center, then E for Edge Mode. Select an edge in the middle of the cube. Right-click select Edge Loop Around Corners, then select the edge adjacent to the one you already have selected; this should automatically select all the edges around the center of the cube. Hit Esc then Delete.

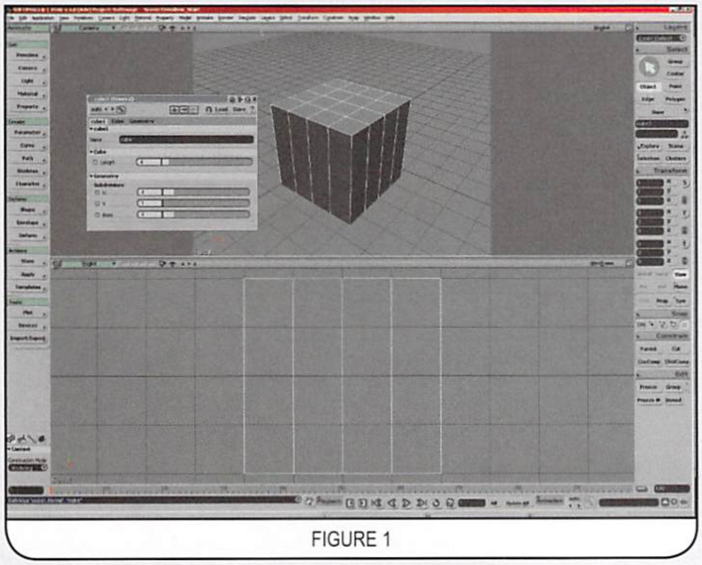


FIGURE 1

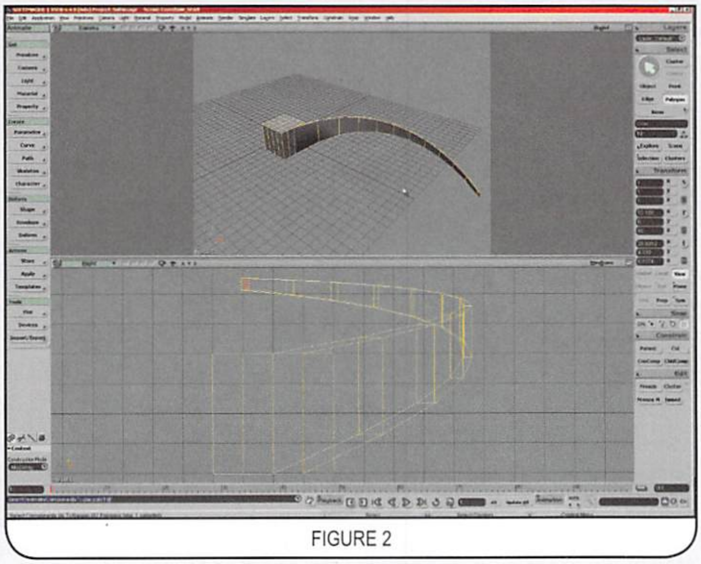


FIGURE 2

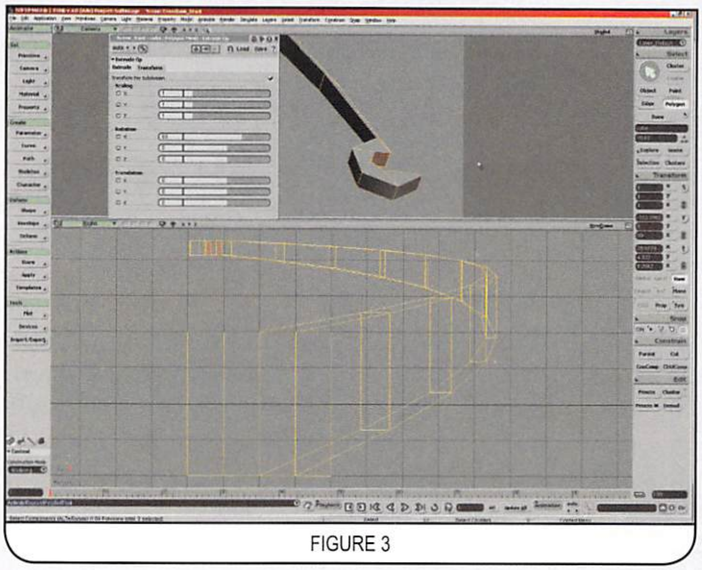


FIGURE 3

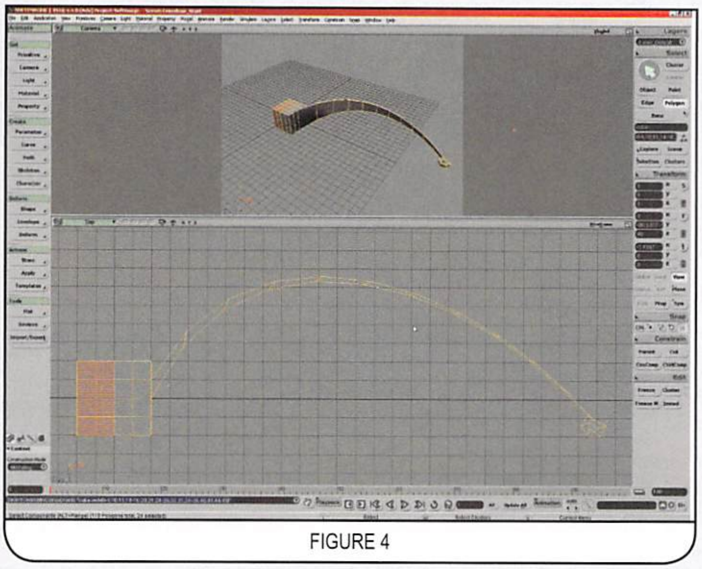


FIGURE 4

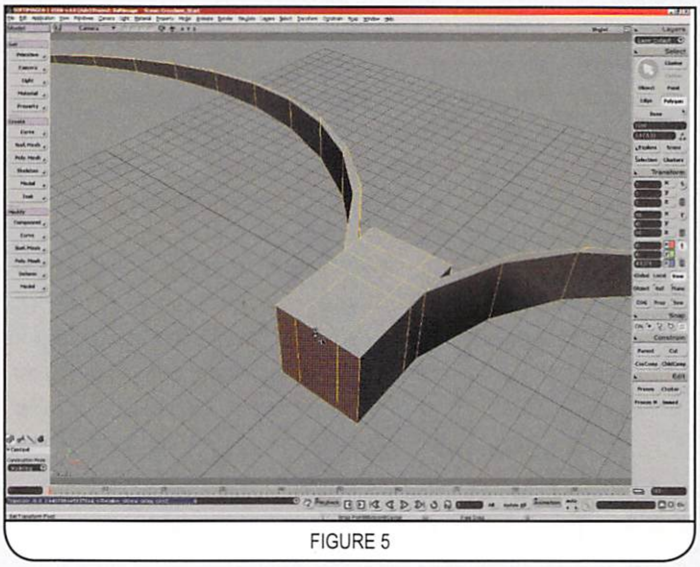


FIGURE 5

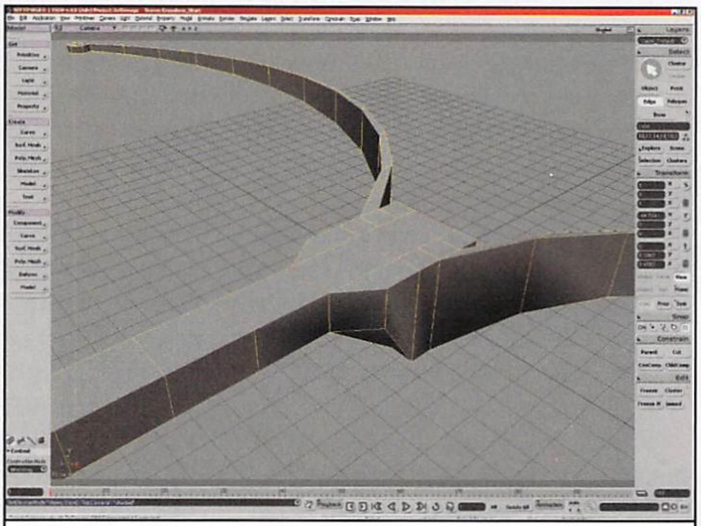


FIGURE 6

Hit the U key and select the center polygons at the back of the cube, then hit the V key to translate the faces back by pulling on the Transform Manipulator in the Z direction. (Note: if you do not see the Manipulator, you will have to enable it on the *Master Control Panel >Transform Panel)* Enter 6.0 for the Z Values on the Transform panel, hold down the CTRL key, and click on the polygon to the right and left of the center polygon. Hit V to translate, then the Alt key to move the transform pivot toward the top center polygon. *(Figure5)* Now, hit the X key to scale and drag downwards on the Y Manipulator until the value is around 1.13 in the Transform panel. Hit Esc, then select the center polygon and right-click select Extrude Along Axis. Enter 3 for SubDivs, click on the Transform tab, then enter 10 in Translation Y and uncheck Transform Per Subdiv. Next, hit E to go into Edge Select mode and select the six edges from the top of the Crossbow. *(Figure6)* Right-click and choose SubDivide

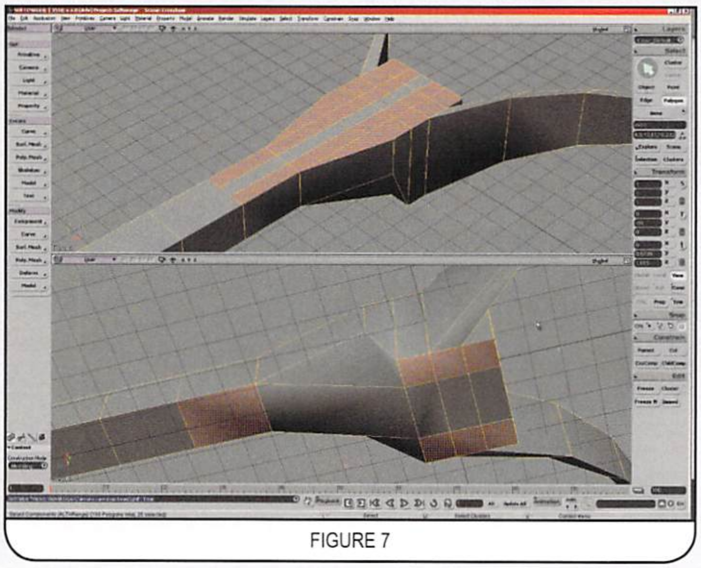


FIGURE 7

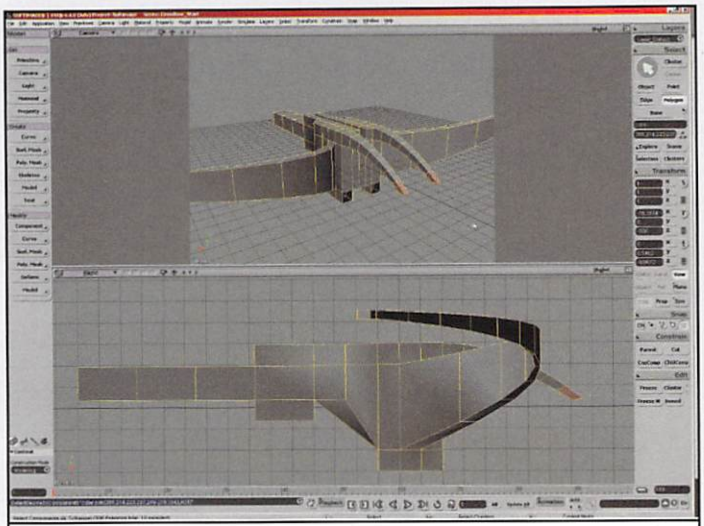


FIGURE 8

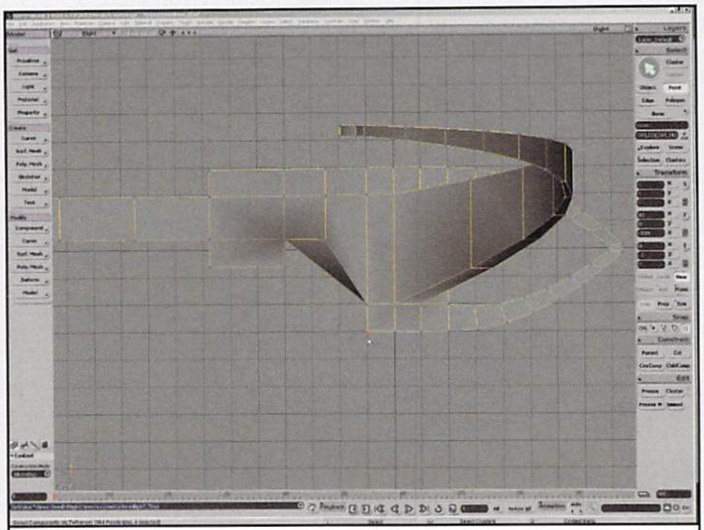


FIGURE 9

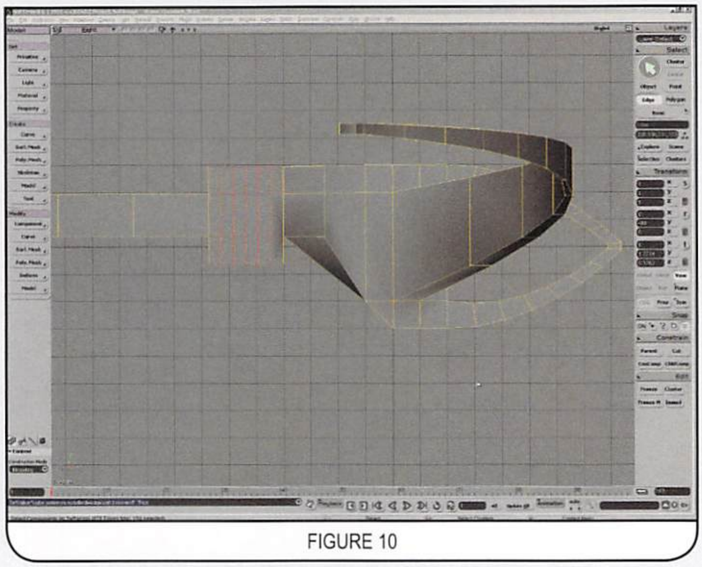


FIGURE 10

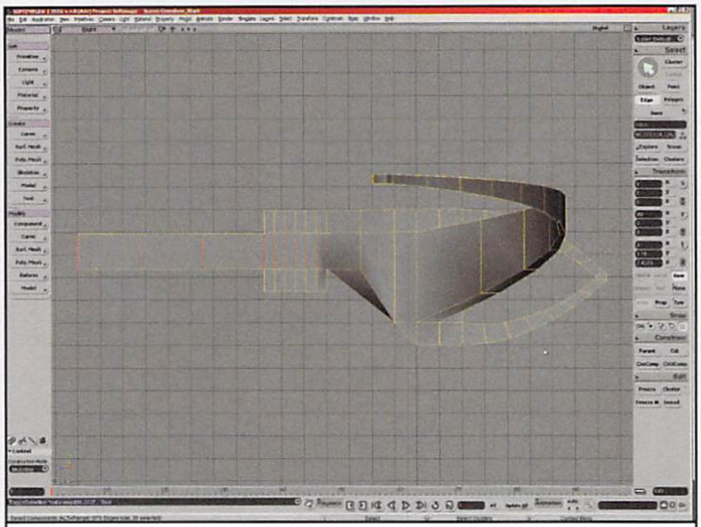


FIGURE 11

Edges Evenly and enter 3 for the value. Go back into Raycast mode, select the top and bottom polygon minus the center ones *(Figure7)* using the Ctrl key to add to your selection and right-click Extrude Along Axis. This will be our channel for the Arrow.

Select the outer two top polygons in the front of the Crossbow's head and hit the Period key. This will repeat the last command. Enter 7 for the Length, 6 for Subdivs, click on the Transform tab, and enter .317 for X and Z scaling and 57 for X Rotation. Now, select the bottom two polygons opposite of the top one that we just modified and hit Delete. In the right view, hit the Y key and drag a region around the two top tips of the extruded faces. *(Figure8)* Hit Shift and the + key to expand the selection until you're at the base of the extrusion, and then right-click select Symmetrize Polygons. Select the Y-axis in the Property Page for Plane Normal; the symmetrized polygons should now be welded to the bottom base of the Crossbow.

We will now go back into the construction history by clicking on the Selection button in the Master Control Panel and expanding Extrude Op [2] 2X. Click on Extrude Op [4] and enter 64 on X for a more rounded look. In the right view, hit the Y key and drag a region around the four tips of the extruded polygons and then right-click select Bridge Polygons; now, select the inner middle polys of the new Bridges selection and hit the Period key. In your right view, select the bottom points by using the T key and dragging a region around them. *(Figure9)* Right-click and choose Collapse Components. Still in the right view, hit E and select the Edges of the extruded part of the handle where the body meets the bow. *(Figure10)* Hit Shift + D to subdivide edges and enter 6. While you're still in Edge mode, drag

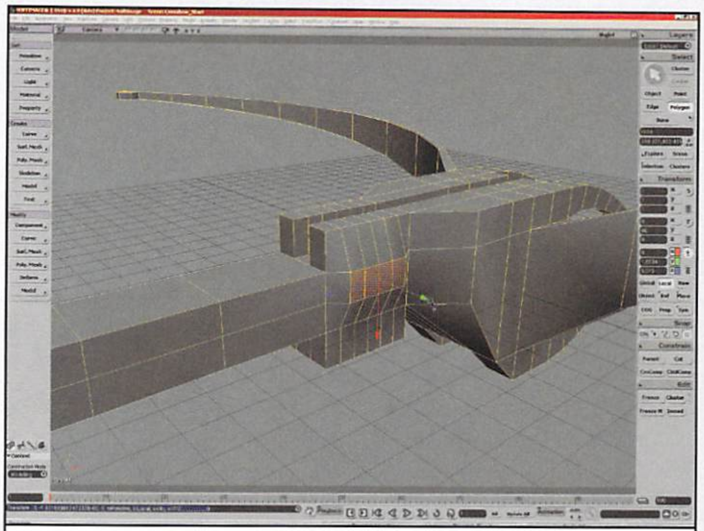


FIGURE 12

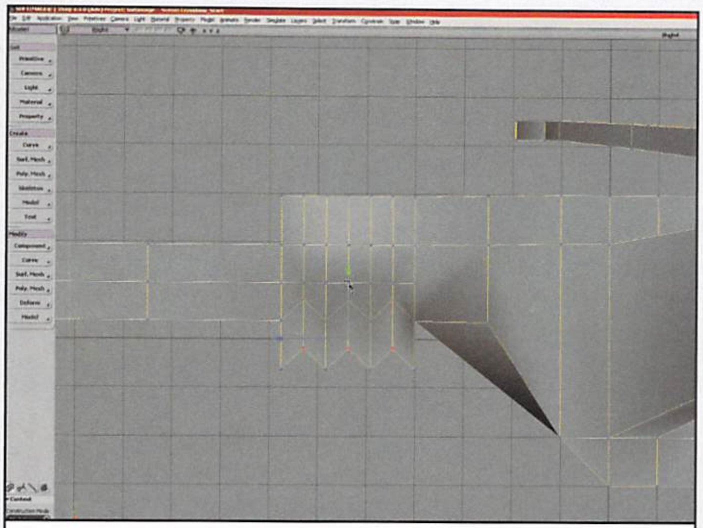


FIGURE 13

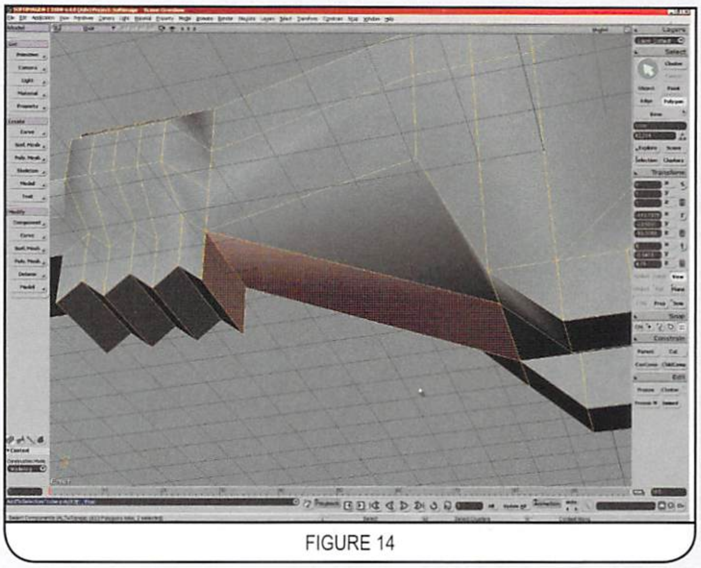


FIGURE 14

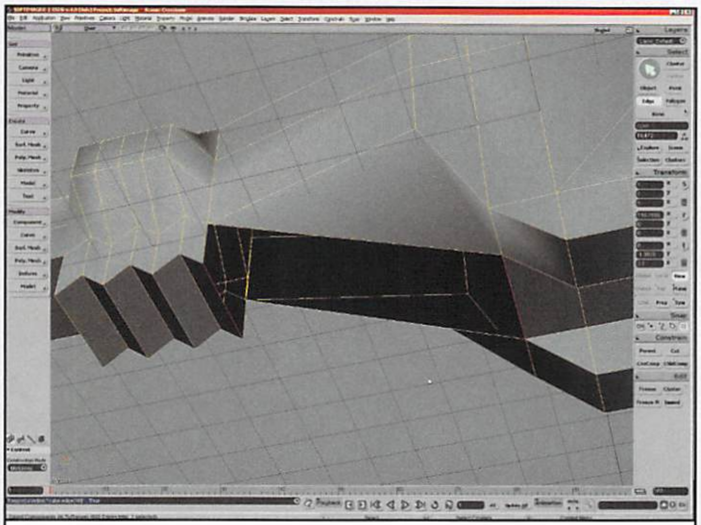


FIGURE 15

a region from the same extruded area to the length of the body *(Figure11)* and hit the Period key. Leave the default value at 2. Select the four polygons on each side of the neck area of the bow, and in Raycast mode, hit V to translate. Right-click select Local mode. Unselect COG in the Master Control Panel, then drag on the Y Manipulator *(Figure12)*; both sides should now expand outwards. In the right view, hit the T key, then tag every second line of points. *(Figure13)* Hit the V key to translate, right-click select Global mode, then translate upwards to resemble a grip. Hit Esc, then Spacebar. You can always hit the + key to change the SubD level of your object to show how it will look in SubD mode, then – to return it back to its default SubD level. You can make adjustments to the grip as you see fit.

Now, select the adjacent face on the front of the grip, which is at an angle in Raycast mode, *(Figure14)*

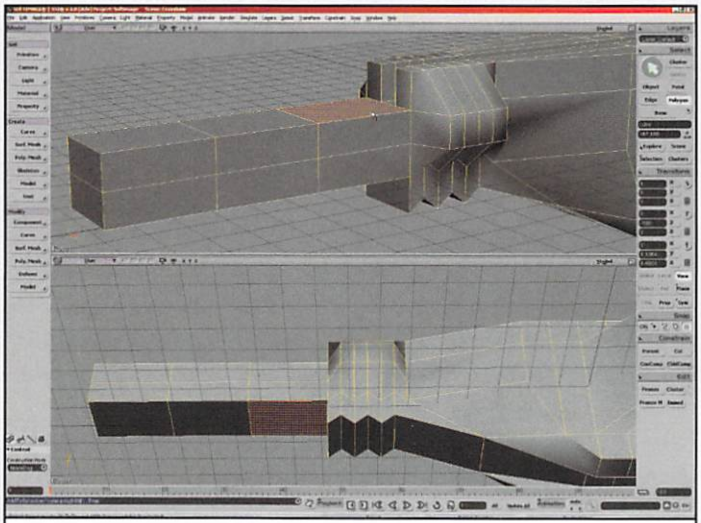


FIGURE 16

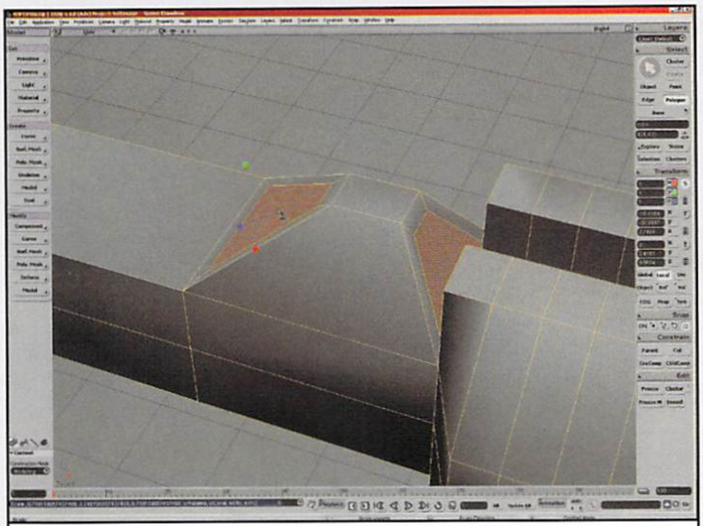


FIGURE 17

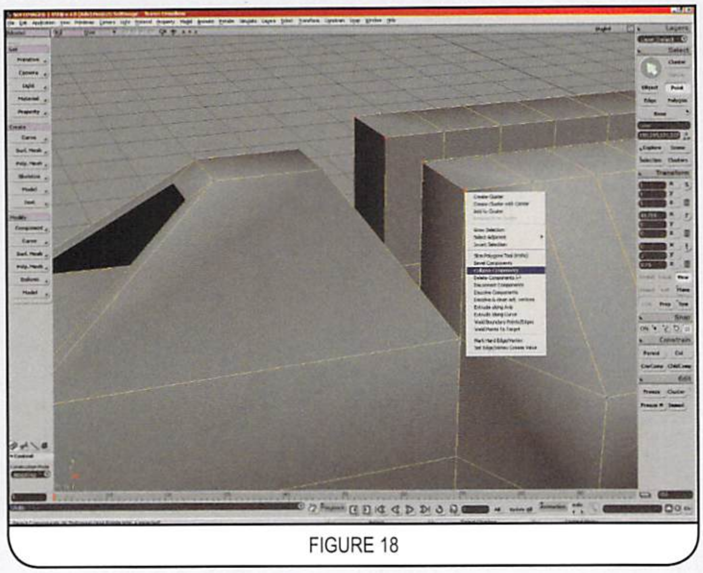


FIGURE 18

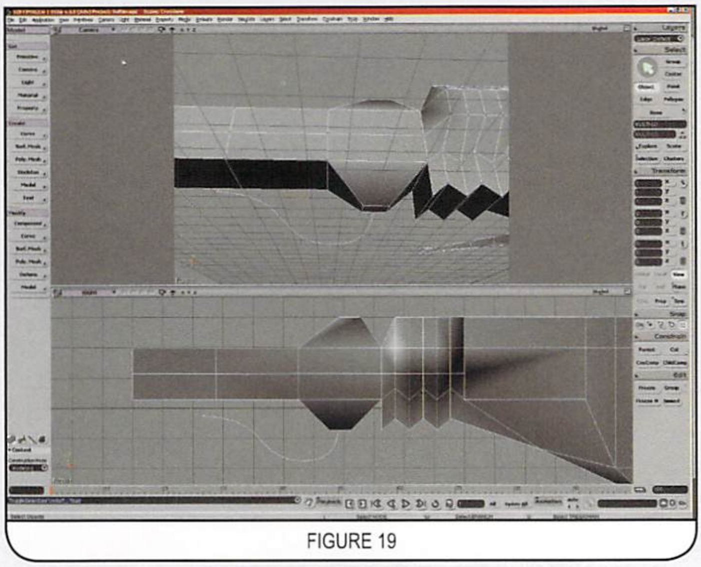


FIGURE 19

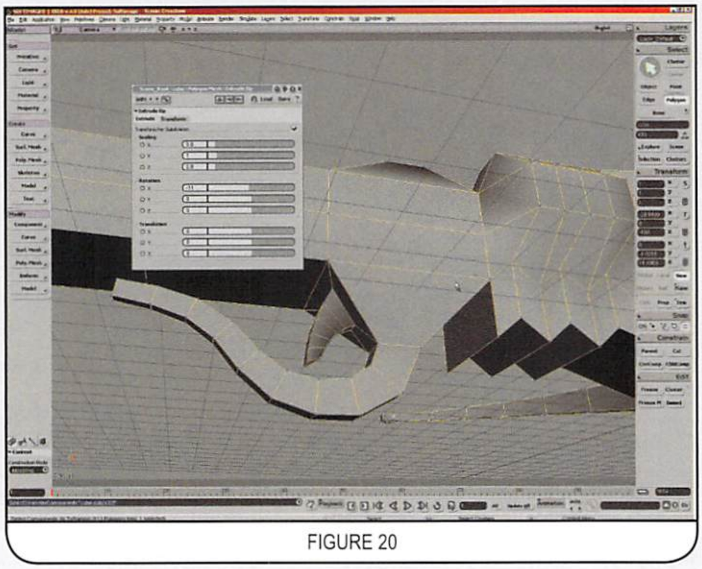


FIGURE 20

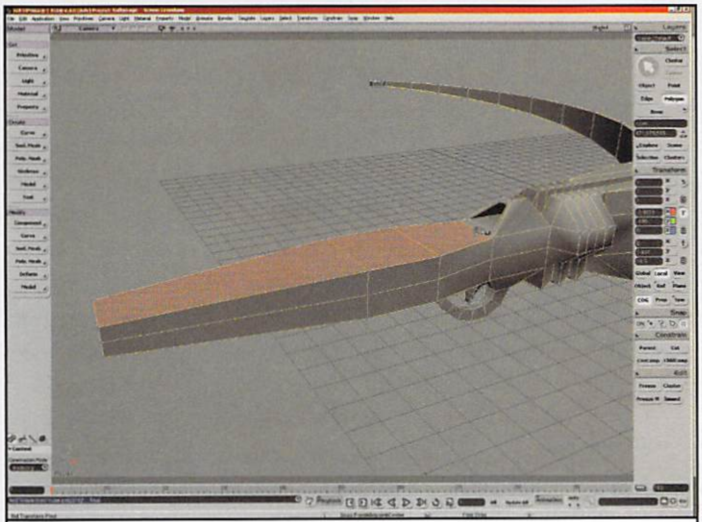


FIGURE 21

and hit Delete. Select the two edges, *(Figure 15)*, and then right-click select Weld Boundary points and edges.

In Edge mode, select the edges below the grip and hit shift + D. Leave the values at 2, then in Raycast, select the top and bottom polygons nearest the grip *(Figure 16)*. Right-click select Extrude Along Axis, then click on the Transform tab in the Property Page and enter .265 for the X and Z Scale values. In Edge mode, select the two center edges on the front of the top polygon that we just extruded so that they are one polygon face, then select the Center polygons on the front and back of the top extruded faces. Hit Ctrl + d to duplicate, hit the X key, then right-click select Local mode. Now center your mouse in the middle of the manipulator so that it shows XYZ, then begin to drag the manipulator with the left mouse button so that you can

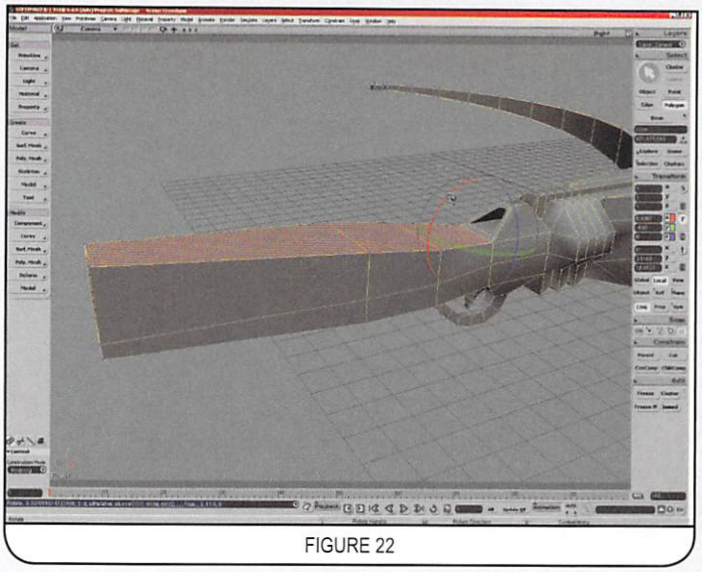


FIGURE 22

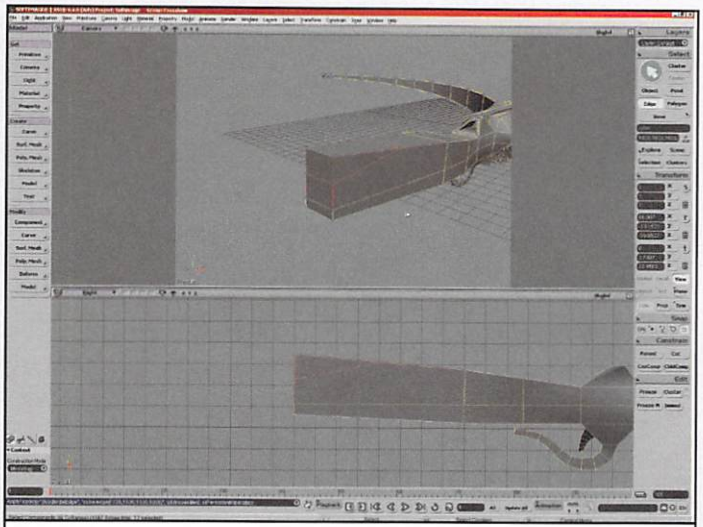


FIGURE 23

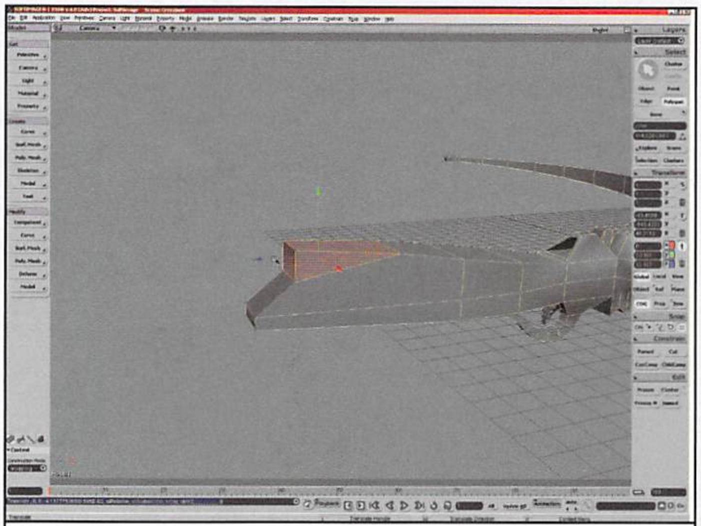


FIGURE 24

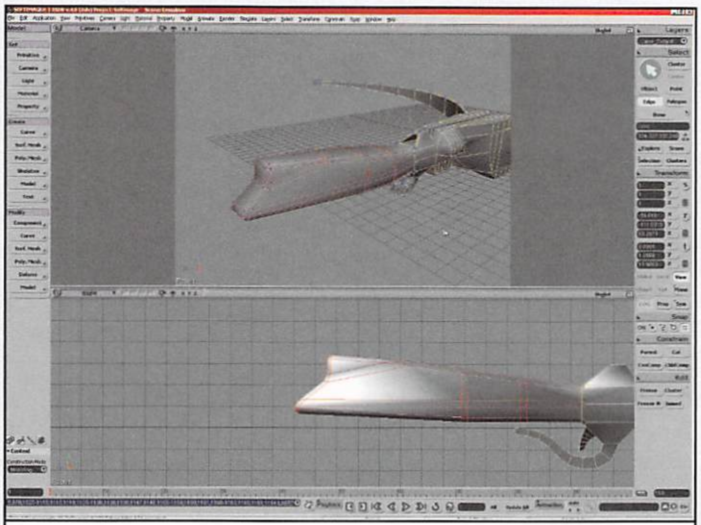


FIGURE 25

see the faces scaling towards the center. *(Figure17)* Hit Esc, right-click and select Bridge polygons. You can also collapse the four points near the new bridge object. *(Figure18)*

In the right viewport, go to the Model panel and click on *Create>Curve>Draw Cubic by Cvs*, now begin to draw a curve from the bottom extruded face. *(Figure19)* Next, select the bottom extruded face in Raycast mode, right-click select Extrude Along Curve, and select the curve. Enter 8 for the Subdivs and .9 for the X and Z Scaling. Now, select the polygon face, which is at a slant above the newly extruded object and hit CRTL+D then X. To scale inwards from the center of the polygon, hit Esc, and right-click select Extrude Along Axis. Enter 4 for SubDivs, .8 in X and Z scaling, then –11 for X Rotation. This will be your trigger. *(Figure 20)* You can adjust the Rotation or Translation of the trigger to your liking.

In Point Selection mode (T key), select the end 12 points of the handle and hit X, right-click select Global and COG, then drag on the red manipulator to make the butt of the Crossbow handle wider. Now, select the two polys at the butt of the handle, right-click and Extrude Along Axis, and enter 8 for Length. In Point mode, select the last six points of the butt, then hit X and scale inwards from the center of the Manipulator to make the butt of the Crossbow smaller. We'll now select the last three polygons from the top of the Crossbow's handle and hit C to rotate them. Right-click select Local, then hold the Alt key and drag the center to the middle of the first polygon's edge. *(Figure21)* Rotate on X by dragging on the X Manipulator to lift the back of the handle upwards. *(Figure22)*

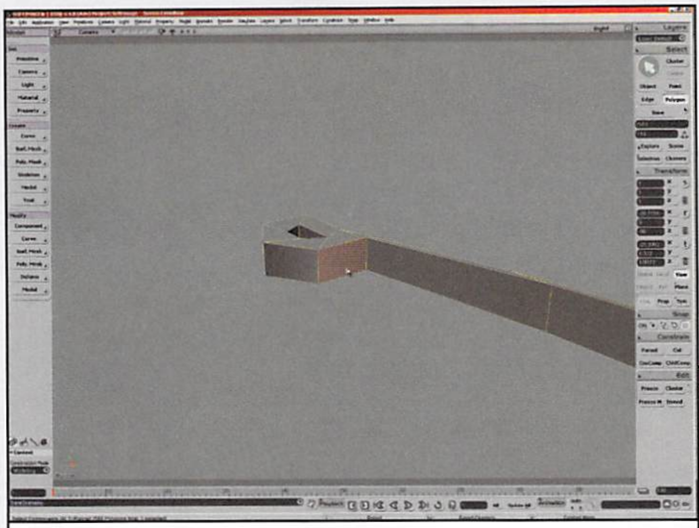
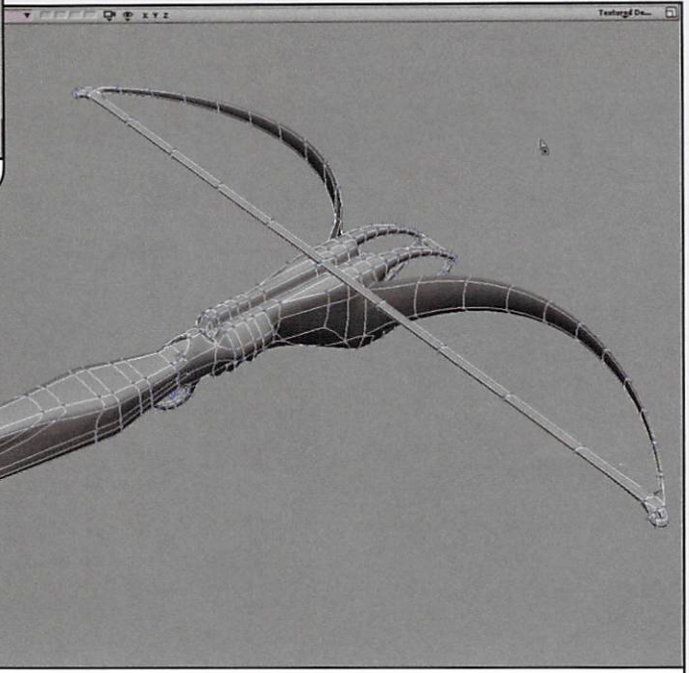


FIGURE 26



THE FINAL CROSSBOW

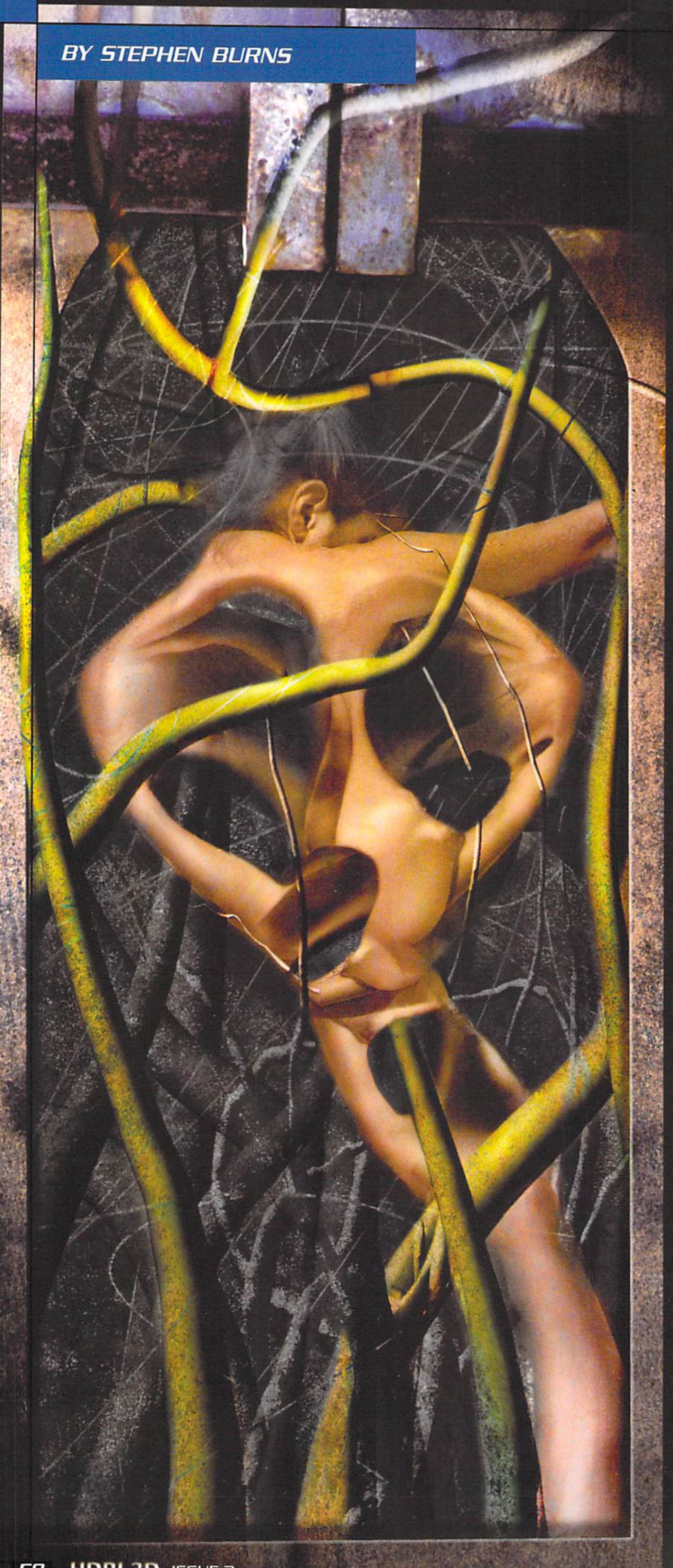
In the right viewport, hit E, then left-click and drag a region around the upper back and top edges, Deselect the Top Center and hit Shift + D *(Figure23)* to subdivide the edges. In Raycast mode, select the top four polygons of the newly subdivided faces and hit V, then right-click select Local mode, click on the Z Transform Manipulator, and drag towards the front of the Crossbow. *(Figure24)* In Edge mode, hit the E key and draw a region around the butt of the Crossbow, then hit Shift and + to grow the selection until you reach the trigger. Now right-click and choose Bevel Components. You can experiment with the slider to see how the Bevel relates to the edges with different values. In this case, we will leave it to the default options. *(Figure25)*

We'll now create the string by selecting both the faces of the inner curve of each side of the bow using the U and CTRL keys. *(Figure26)* Right-click select Bridge Polygons. Now select the edges of the newly created sting, right-click select Subdivide Edges, and enter 10. Now with the entire Crossbow selected, click on Selection in the Master Control Panel and scroll all the way down to Extrude Op2. Expand it, then double-click on Extrude Op and move the slider on the Translation Z rotation until the sting meets the top of the Crossbow channel. You can now continue making modifications to the Crossbow to your liking. Hopefully, with this tutorial you gain a bit of knowledge on some of XSI's Modeling workflows. Texturing and Rigging the Crossbow is a different story for another tutorial.

WILL MENDEZ IS AN XSI GENERALIST / ZEALOT LIVING IN CANADA, HE IS THE XSI BASE AMBASSADOR AND PRESIDENT/FOUNDER OF THE XSI USER GROUP IN MONTREAL. WILL HAS ALSO DONE CONTRACT WORK FOR SOFTIMAGE IN TECHNICAL SUPPORT AND QUALITY ASSURANCE DEPARTMENTS.

BIG UP TO CHINNY AT SOFT.

BY STEPHEN BURNS



PHOTOSHOP CS AND LIGHTWAVE [8]

for Fine Art

I have always been fascinated with the fine art potentials of using Photography and 3D. The most obvious application of the two mediums would be to use photographic images as surface maps for 3D objects. These images, of course, can be scanned or shot with any digital camera. Because I strive for my work to be somewhat unpredictable in terms of the applied technique, I chose to use photography as the basis of the final piece and integrated into it 3D objects created in LightWave [8]. My intention was to create an image that is not only surrealistic, but aggressive in nature. So, let's discover how photography, 3D sculpturing, and Photoshop are used to create "Sticks."

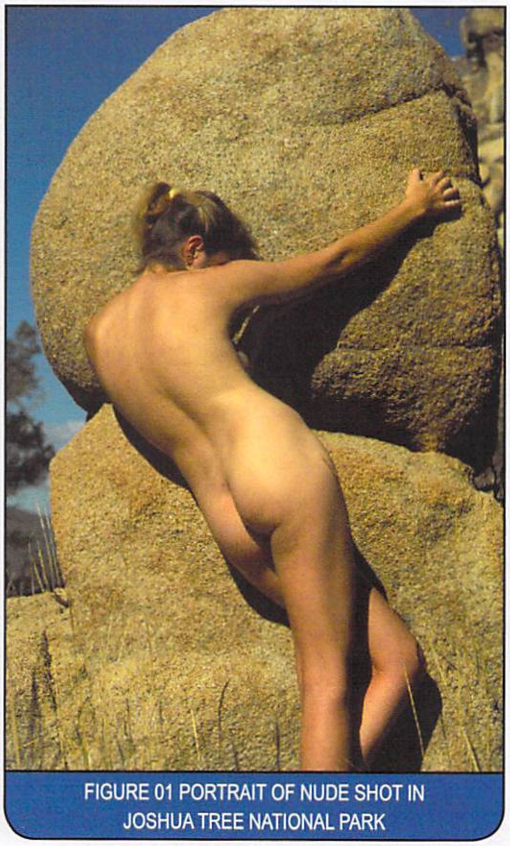


FIGURE 01 PORTRAIT OF NUDE SHOT IN JOSHUA TREE NATIONAL PARK

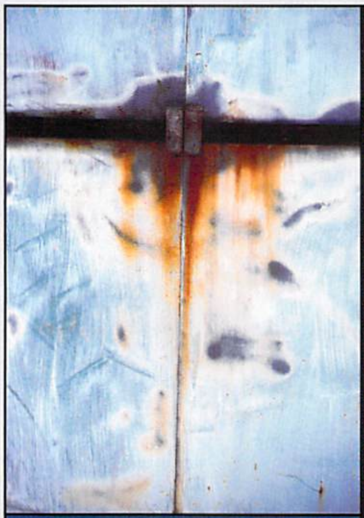


FIGURE 02 RUSTED METAL BOLTS AND DILAPIDATED DOOR

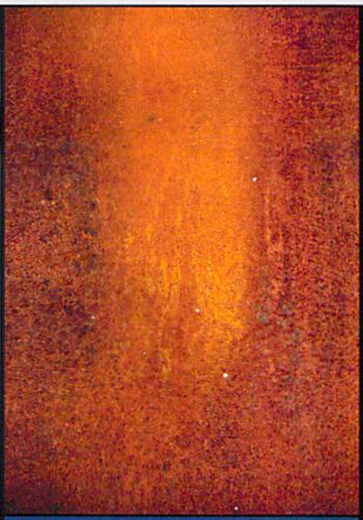


FIGURE 03 RUST DETAIL OFF OF AN OLD WATER TANK

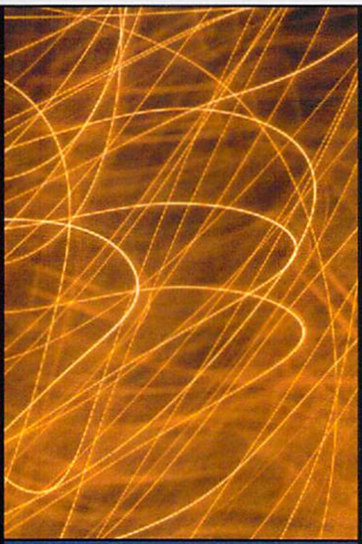


FIGURE 04 IN CAMERA LIGHT EFFECTS

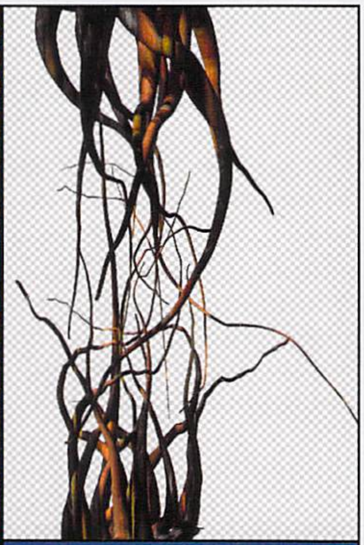


FIGURE 05 3D ROOTS

Let's look at the images that were used to create the final piece *(Figures 01 - 05).*

The final piece resulted in an interesting biomorphic female nude, but all good portraits should have a background that allows the figure to stand out prominently. In this case, I wanted it to be aggressive in nature, but at the same time, not conflicting with the main subject. Using elements that were all unrelated proved not only to be a challenge, but it also taught me how to view everything as potential source material in an effort to consolidate the vision. I began by using LightWave [8] Modeler to create a series of root-like protrusions.

STEP 1

To begin, a 2x2 meter plane is created. *(Figure 06)*

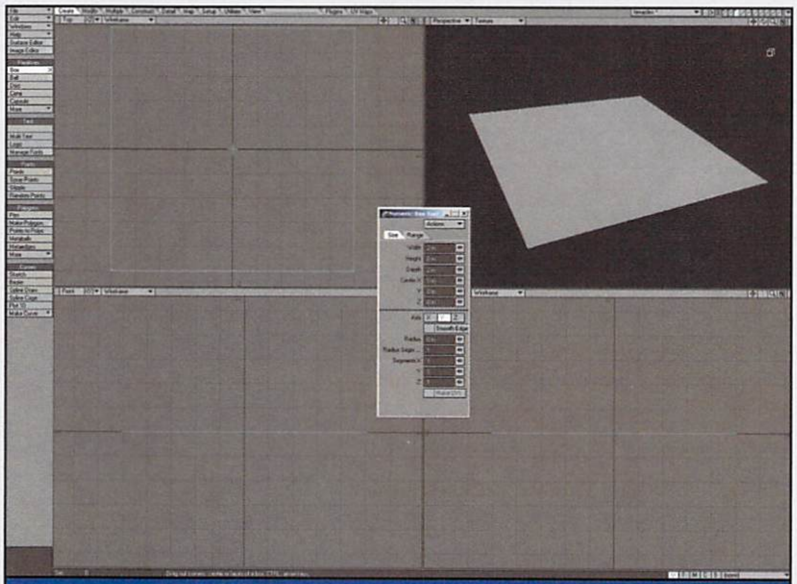


FIGURE 06 2 METER PLANE CREATED

STEP 2

The plane needs to have more geometry from which the roots can be extruded, so it is subdivided (Shift-D). *(See Figure 07)*

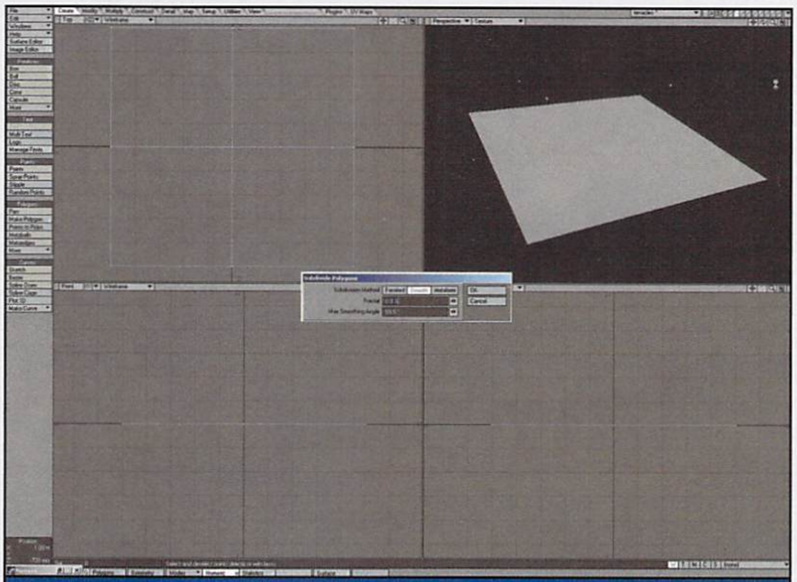


FIGURE 07 PLANE IS SUBDIVIDED

STEP 3

Next, the plane is subdivided again so that it has 16 polygons; in addition, the subdivision surfaces are applied by hitting the Tab key. This, in essence, is applying addition points to give the roots a rounded and organic feel. In addition, this extra geometry is ideal to have when the displacement map is applied later on. Now that we have the foundation for our roots, let's go create them. *(Figure 08)*

STEP 4

Activate the Magic Bevel and hit the N key. First of all, notice that there are blue circular handles in the center of each polygon. By clicking and dragging them out, a series of beveled shapes has been created that resembles roots. *(Figure 09)*

STEP 5

We have some options available to make modifications to the beveled shape. In figure 10, the scale in the numeric panel has been set to 100%. This allows the width of the beveled shape to match the width of the polygon that it was created from. A smaller percentage will taper the tip more drastically over time. The higher the percentage, the more subtly the taper will take affect over time. Figure 11 shows the results of the scale set of 96%.

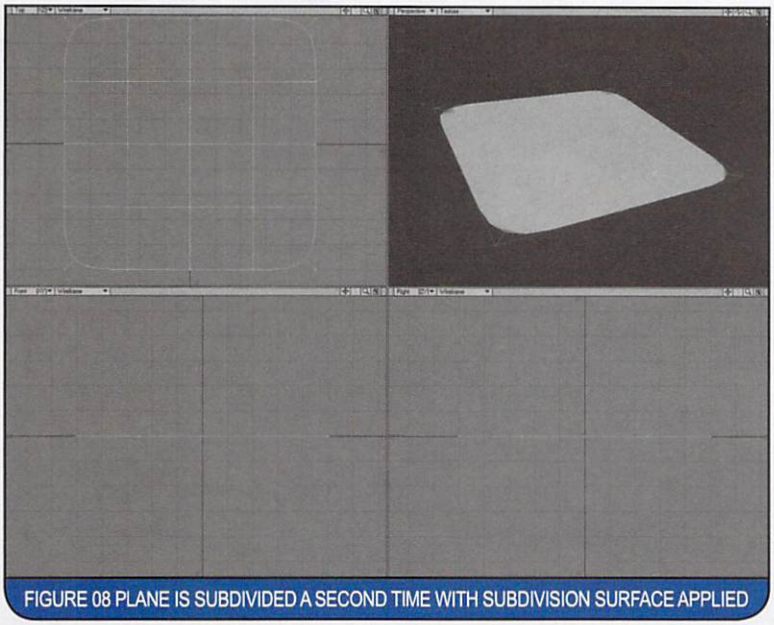


FIGURE 08 PLANE IS SUBDIVIDED A SECOND TIME WITH SUBDIVISION SURFACE APPLIED

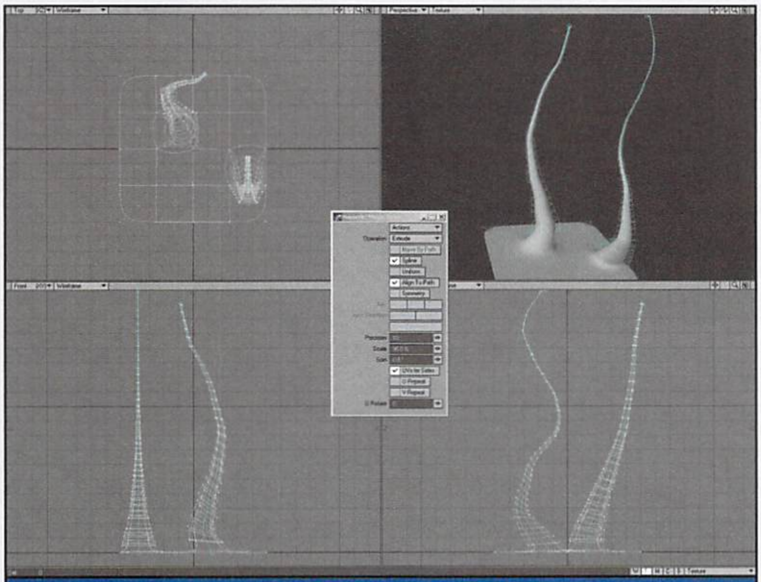


FIGURE 09 MAGIC BEVEL APPLIED TO GEOMETRY

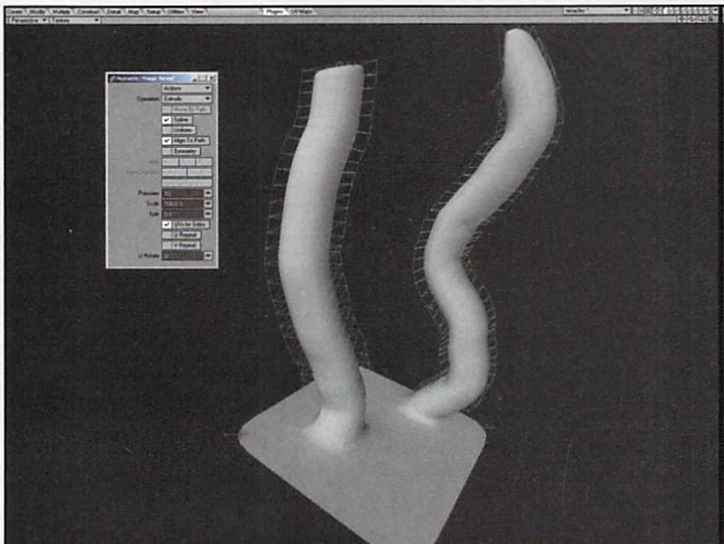


FIGURE 10 SCALE SET TO 100%

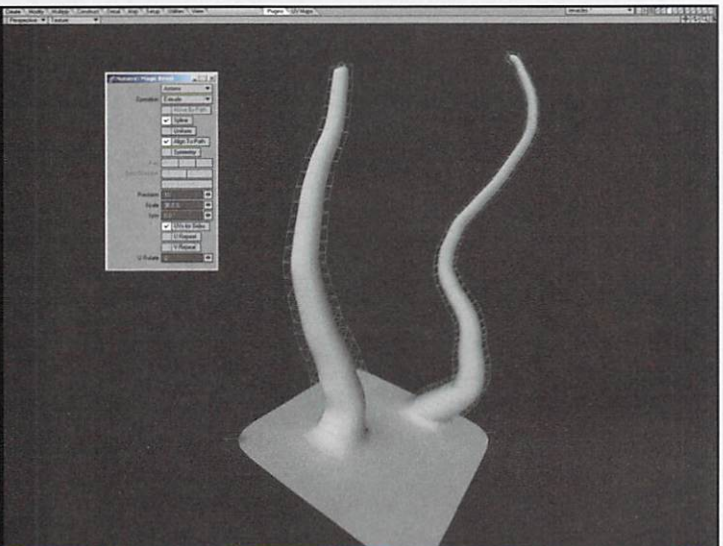


FIGURE 11 SCALE SET TO 96%

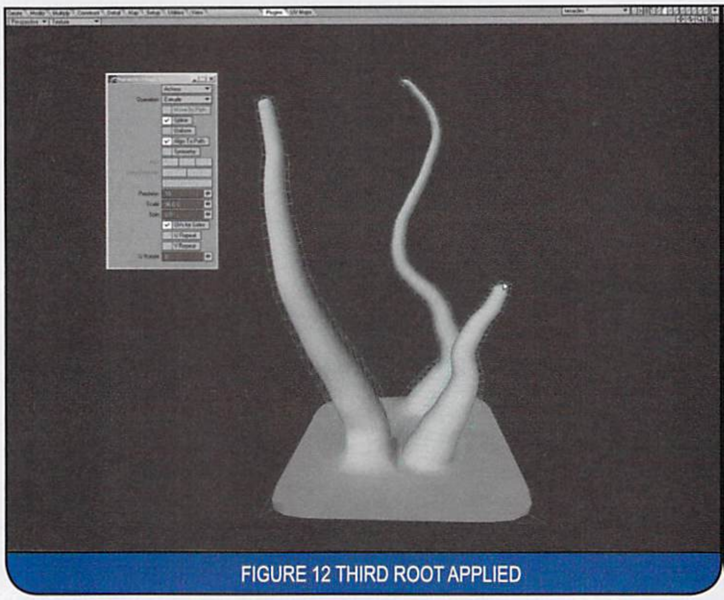


FIGURE 12 THIRD ROOT APPLIED

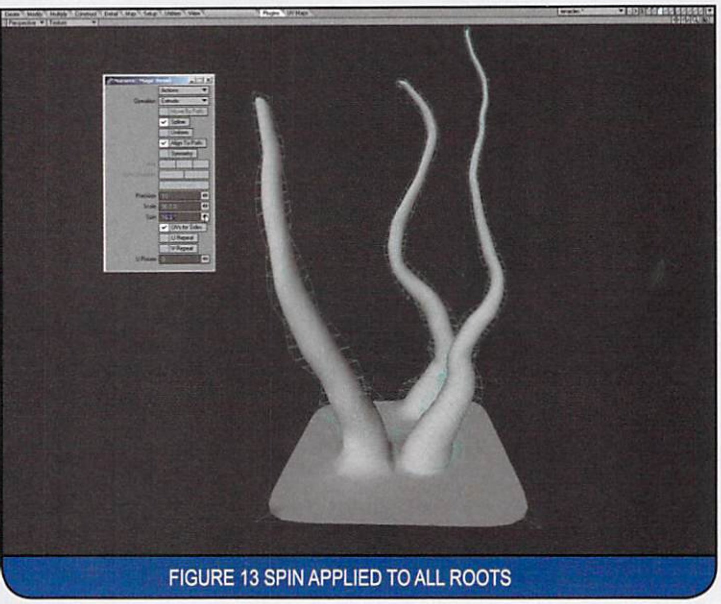


FIGURE 13 SPIN APPLIED TO ALL ROOTS

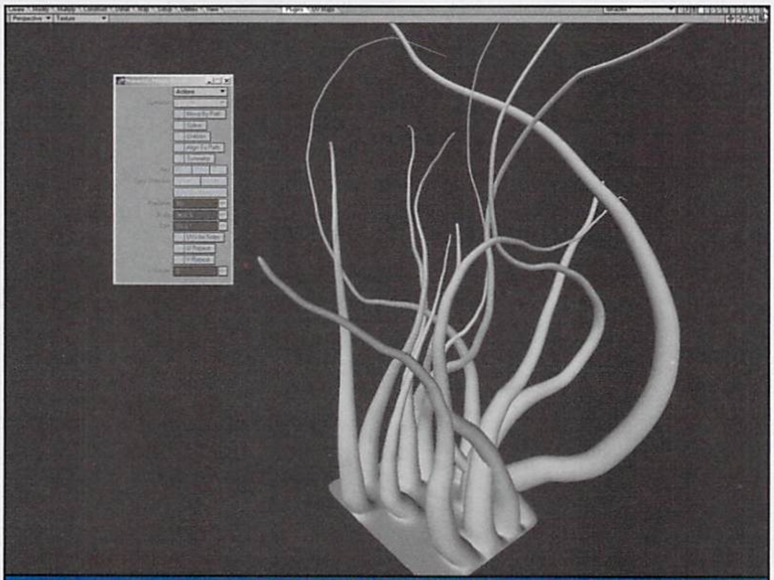


FIGURE 14 COMPLETED MODEL

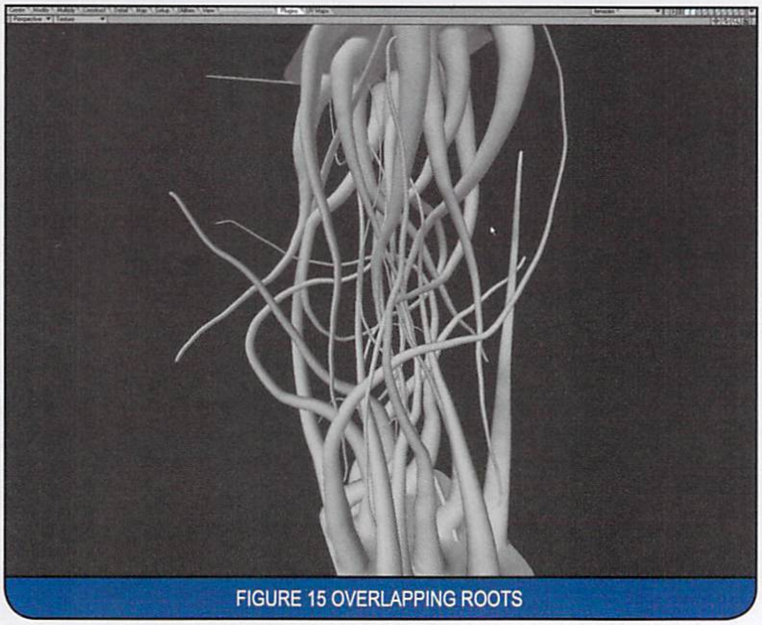


FIGURE 15 OVERLAPPING ROOTS

STEP 6

I like to work in perspective view so that I can have some control as to how the root takes shape in 3D space. After applying a third root, as shown in figure 12, another option is applied in the numerical panel. This time it's the Spin command. This simply gives the artist the ability to twist all of the shapes applied in the Magic Bevel's command. A twist of 16.3 degrees was applied in this example *(Figure 13).*

STEP 7

Figure 14 shows the completed model with several roots twisting in every direction. The goal here is to create 3D shapes that resemble twisted sticks. This will be used to integrate into the background of our final piece.

STEP 8

Next the shape is copied (Ctrl-C) from its layer and pasted (Ctrl-V) into another layer. It is rotated 180 degrees and positioned so that the tips of the roots overlap. This is all that is needed for now. *(Figure 15)*

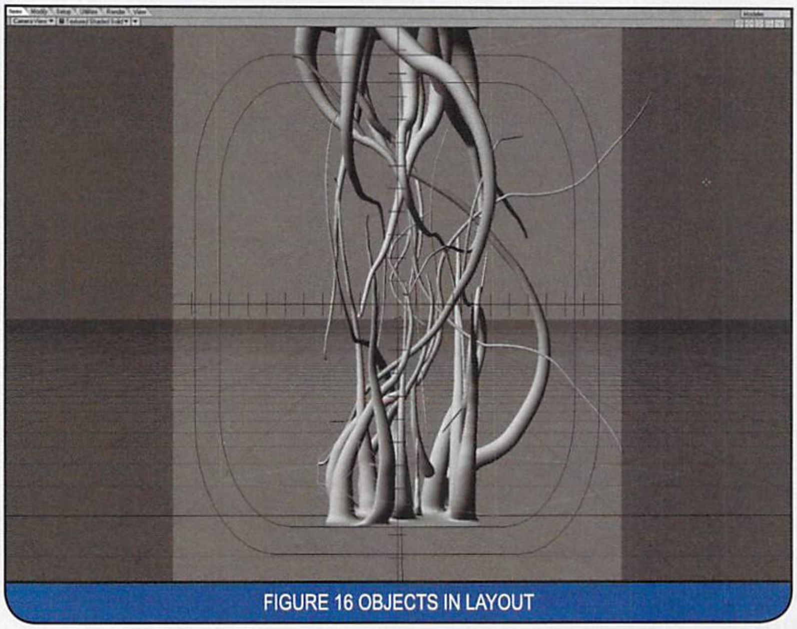


FIGURE 16 OBJECTS IN LAYOUT

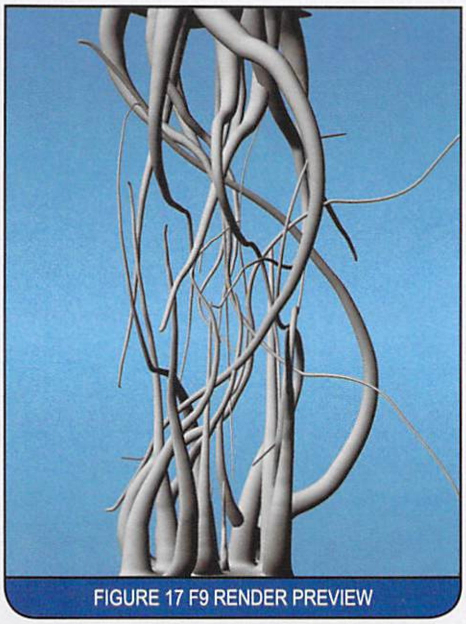


FIGURE 17 F9 RENDER PREVIEW

STEP 9

After the objects are sent to Layout, the Camera Screen Proportions are set to closely resemble the slender format of the final piece. F9 is applied to get a quick view of how the shape will look. *(Figures 16 & 17)*

STEP 10

Next, Displacement and Bump map textures are applied to the surface. Figure 18 shows the settings that were used. Figure 19 shows possible options for applying texture maps created in Photoshop.

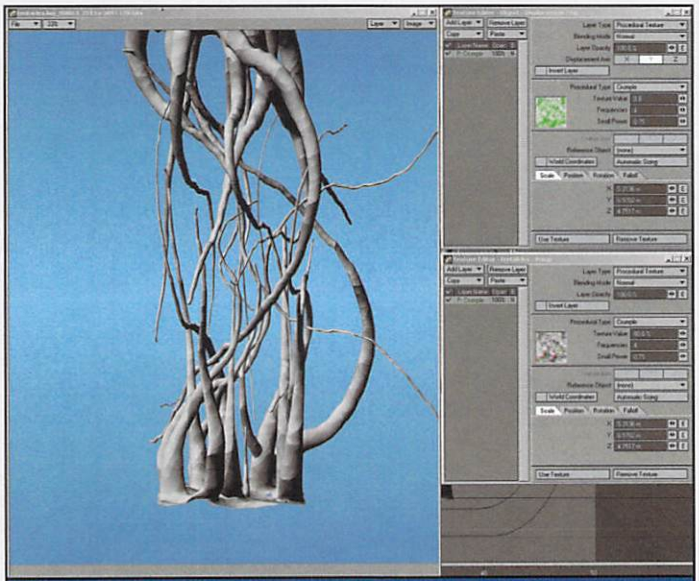


FIGURE 18 SURFACE TEXTURES APPLIED TO 3D OBJECT

CREATING THE NUDE

Now that the roots are completed, let's create the biomorphic nude abstraction.

STEP 1

The morphing process began with a female nude that has been photographed against the sculptured stones in Joshua Tree National Park. In Photoshop CS, the layer is duplicated (Ctrl-J) and transformed *(Edit>Free Transform)* as shown in figure 20 with its blend mode set to Lighten. This has already started the blending effect.

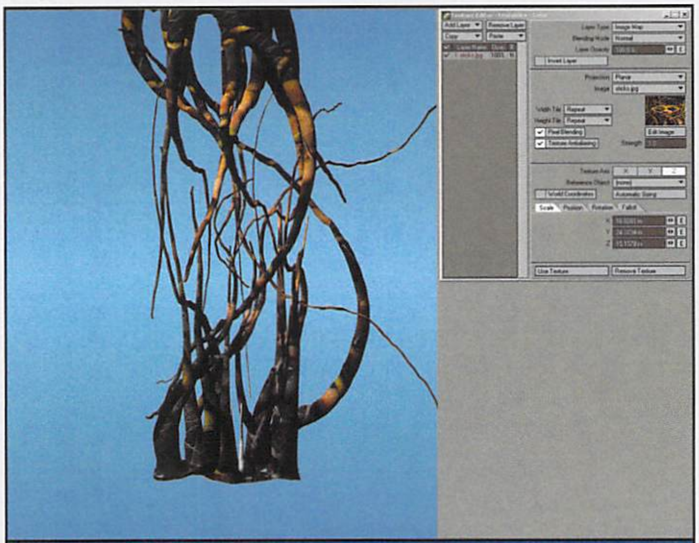


FIGURE 19 SURFACE TEXTURES APPLIED TO 3D OBJECT

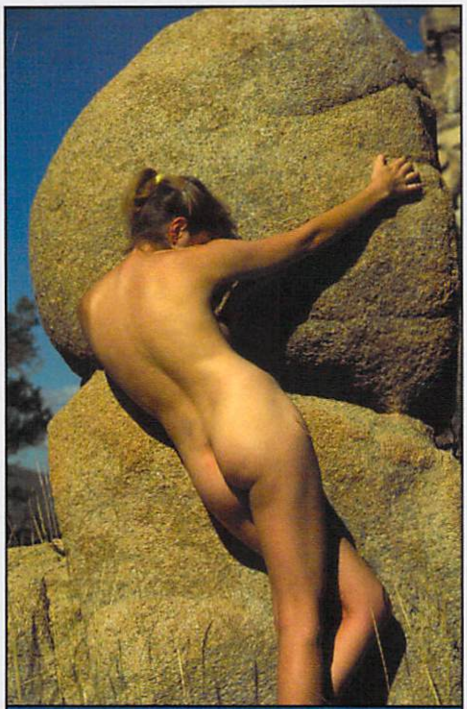


FIGURE 01 FEMALE NUDE

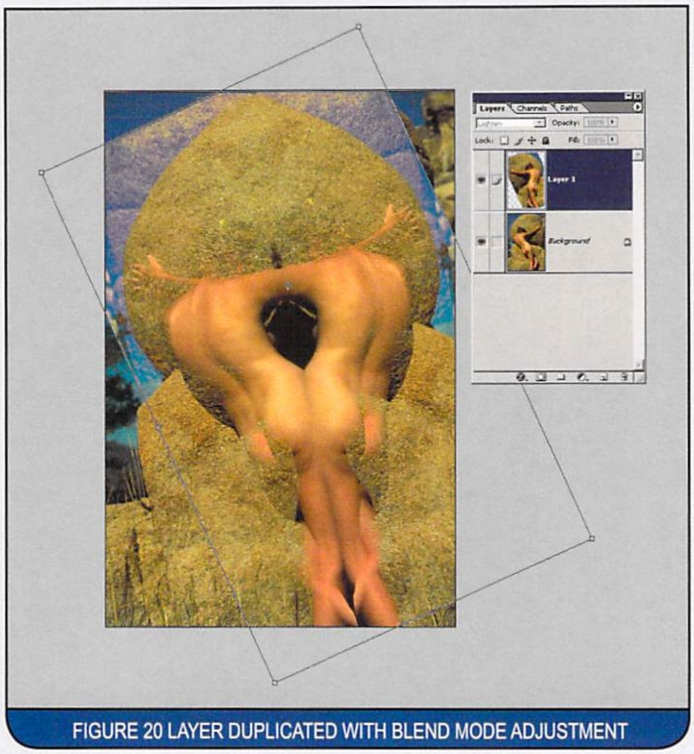

Layers
Channels
Paths
Lighten
Opacity:
Lock:
Fill:
Layer 1
Background

FIGURE 20 LAYER DUPLICATED WITH BLEND MODE ADJUSTMENT

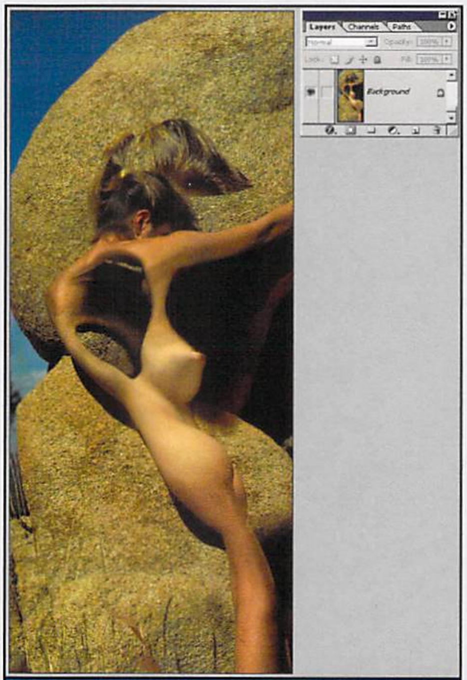

Layers
Channels
Paths
Normal
Opacity:
Lock:
Fill:
Background

FIGURE 21 PARTIAL MORPH

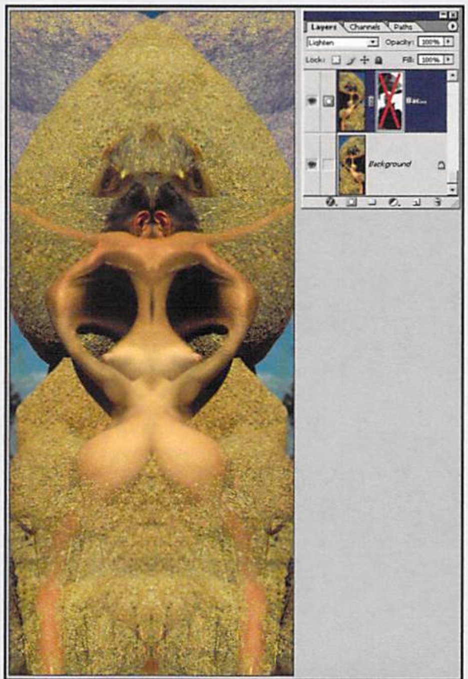

Layers
Channels
Paths
Lighten
Opacity: 100%
Lock:
Fill: 100%
Bac...
Background

FIGURE 22 FURTHERING THE MORPH

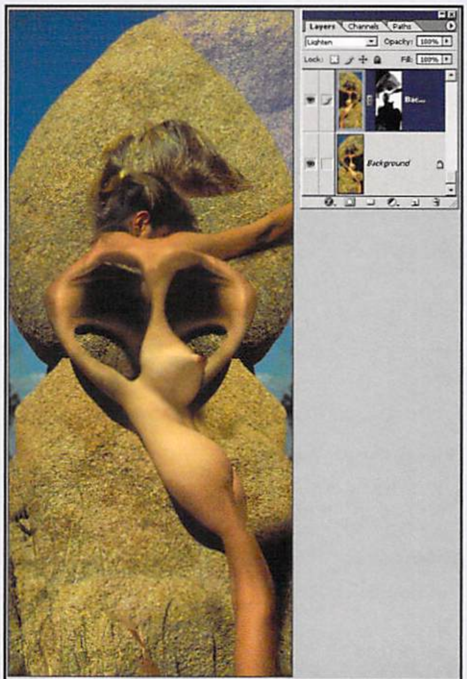

Layers
Channels
Paths
Lighten
Opacity: 100%
Lock:
Fill: 100%
Bac...
Background

FIGURE 23 MASK APPLIED TO THE MORPH

STEP 2

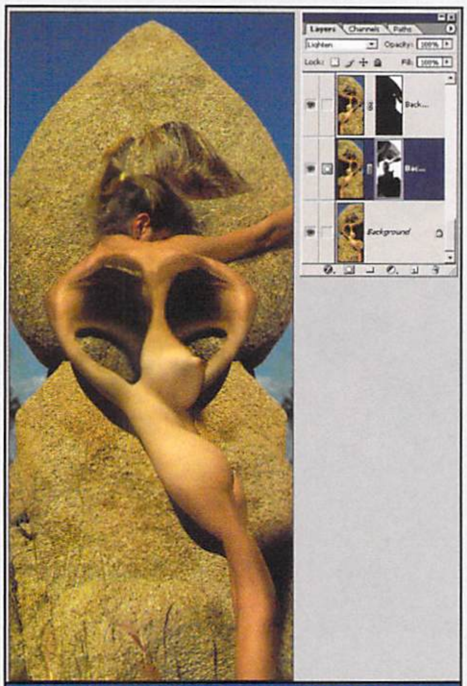
With further experimentation, the intermediate result resembled figure 21.

STEP 3

The same technique is applied using the result from Step 2. By duplicating the morphed nude and setting its blend mode to Lighten so that they blend seamlessly, interesting possibilities start to take shape. It doesn't look like much yet, because masks have not yet been applied. That will be in the next step.

STEP 4

With the layer mask applied, all areas that are painted black on the mask will make the areas of the image that it is associated with go away. So using the WACOM tablet, undesired areas are masked out, leaving the result shown in figure 23.



Layers | Channels | Paths

Lighten Opacity: 100%

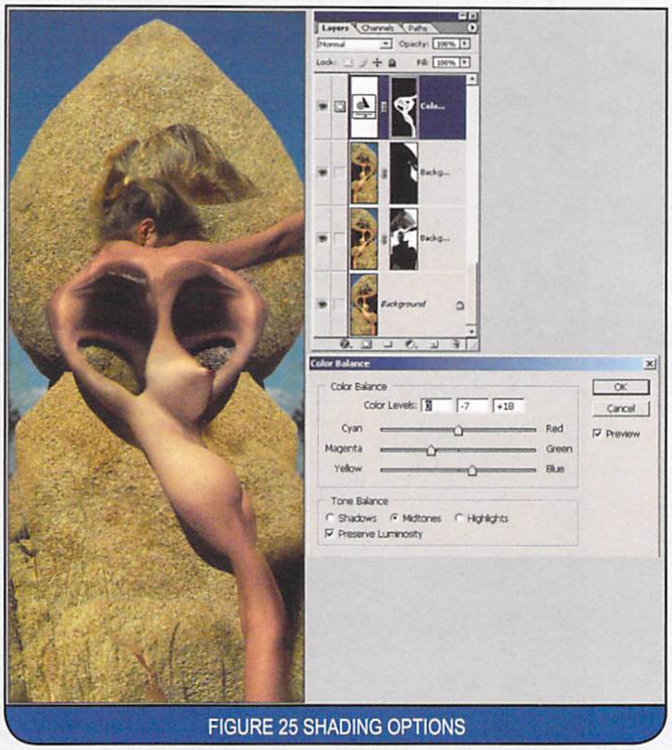
Lock: Fill: 100%

Back...

Bac...

Background

FIGURE 24 SKY BROUGHT BACK INTO IMAGE



Layers | Channels | Paths

Normal Opacity: 100%

Lock: Fill: 100%

Colo...

Backg...

Backg...

Background

Color Balance

Color Balance

Color Levels: 0 -7 +18

Cyan — Red

Magenta — Green

Yellow — Blue

Tone Balance

○ Shadows ● Midtones ○ Highlights

☑ Preserve Luminosity

OK

Cancel

☑ Preview

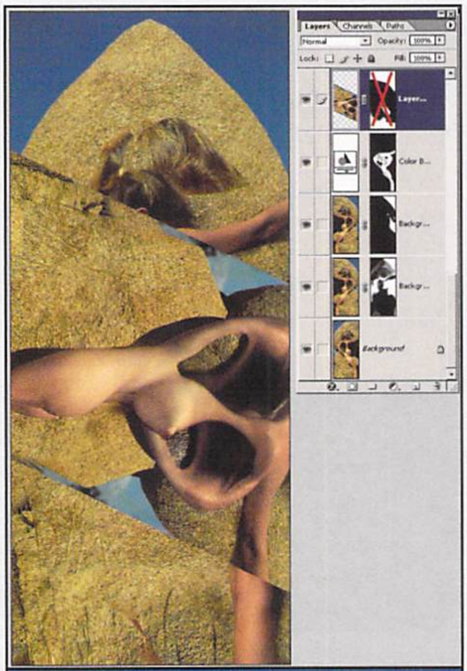
FIGURE 25 SHADING OPTIONS

STEP 5

Next, the top layer is duplicated and masked so that the sky in the top right becomes prominent again.

STEP 6

Next, the image has an overall yellow cast, which blends the foreground and background elements a little too much. The nude needed to stand out on its own a little more, so an Adjustment Layer is added with a mask applied so that only the figure receives the color change.



Layers | Channels | Paths

Normal Opacity: 100%

Lock: Fill: 100%

Layer...

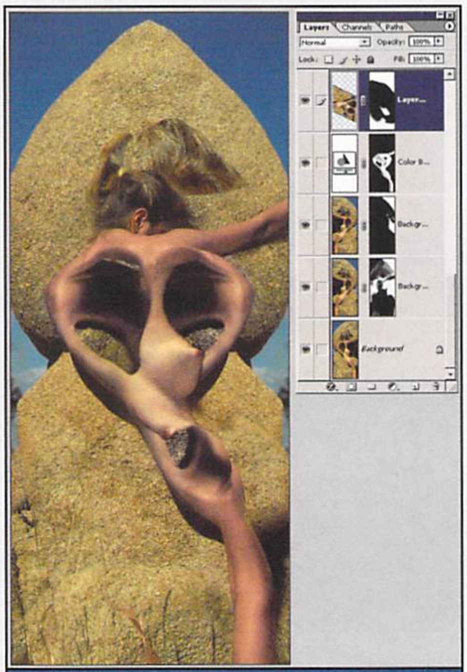
Color B...

Backgr...

Backgr...

Background

FIGURE 26 LAYER IS POSITIONED OVER LEG



Layers | Channels | Paths

Normal Opacity: 100%

Lock: Fill: 100%

Layer...

Color B...

Backgr...

Backgr...

Background

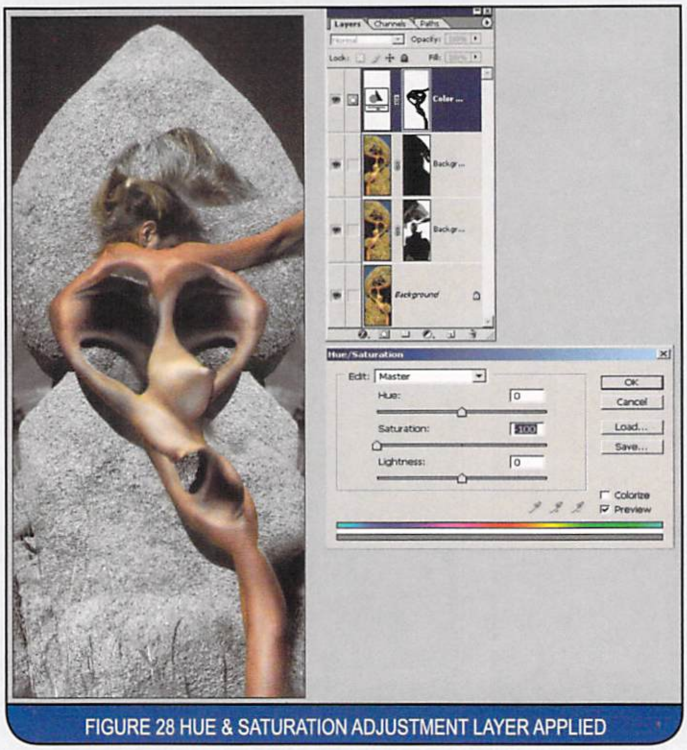
FIGURE 27 LAYER MASK APPLIED TO REVEAL NEW DETAIL

STEP 7

To add some interest to the lower portion of the nude, it is duplicated again, rotated, and positioned so that its cavity is positioned over the leg. Next, a layer mask is applied to reveal the new detail on the nude.

STEP 8

Finally, to further separate the background from the foreground an Adjustment Layer of Hue & Saturation is applied. The Saturation slider is taken all the way to the left to make the image black and white. Notice that the advantage of Adjustment Layers is that they are provided with a mask where its effects can be controlled by painting with black or white. Remember, white allows the effect to show through and black will block out the effect. In this example, the Hue & Saturation is not desired on the body of the nude, so black is painted over that region on the mask. *(Figure 28)*


Layers
Channels
Paths
Opacity:
Lock:
Fill:
Color ...
Backgr...
Backgr...
Background
Hue/Saturation
OK
Cancel
Load...
Save...

Edit: Master
Hue: 0
Saturation: -100
Lightness: 0
☐ Colorize
☑ Preview

FIGURE 28 HUE & SATURATION ADJUSTMENT LAYER APPLIED

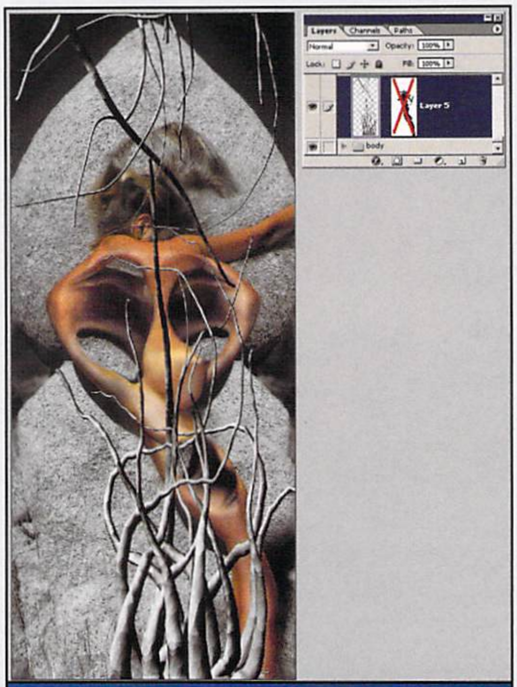

Layers
Channels
Paths
Normal
Opacity: 100%
Lock:
Fill: 100%
Layer 5
body

FIGURE 29 ROOTS APPLIED WITHOUT THE EFFECTS OF THE MASK

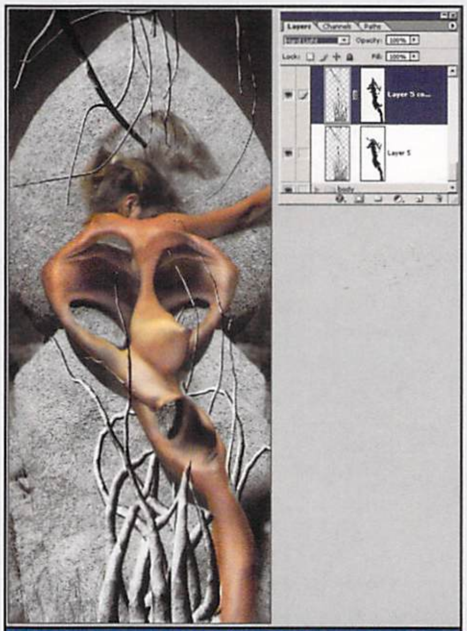

Layers
Channels
Paths
Opacity: 100%
Lock:
Fill: 100%
Layer 5 co...
Layer 5
body

FIGURE 30 ROOTS APPLIED WITH THE EFFECTS OF THE MASK

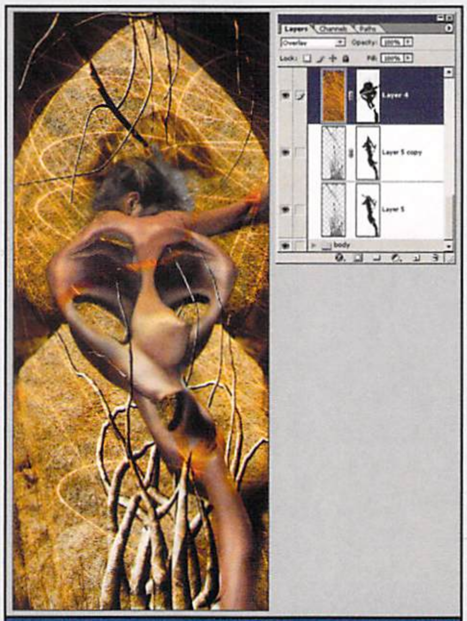

Layers
Channels
Paths
Overlay
Opacity: 100%
Lock:
Fill: 100%
Layer 4
Layer 5 copy
Layer 5
body

FIGURE 31 LIGHT STEAKS ARE APPLIED TO THE BACKGROUND

INTEGRATING THE ROOTS

STEP 1

Although there is an improved distinction between the nude and the background, it still appears a little too simplistic, so this is where we add some sophistication by composting the 3D roots made in LightWave [8] as shown in figure 29. Figure 30 shows how layer masks are applied to allow the body to stay prominent, while the background maintains the roots. In addition, the Roots layer is duplicated and the Layer Blend Mode is set to Hard Light to give them a little more drama.

STEP 2

Next, the image still has a feeling of being too static, so I placed some light streaks that were taken as long exposures at night with a Cannon D-60 as the camera is swirled around. This created some wild kinetic shapes. The Overlay blend mode is applied to integrate the shapes into the background elements. Again, masking is used to isolate most of its effect to the background. *(Figure 31)*

STEP 3

In this step, I wanted the body to take on a change in color and there are a variety of ways to go about this, but I chose instead to use the rust detail I photographed off of an old water tank and placed it in a layer above the nude. Next, the blend mode is changed to

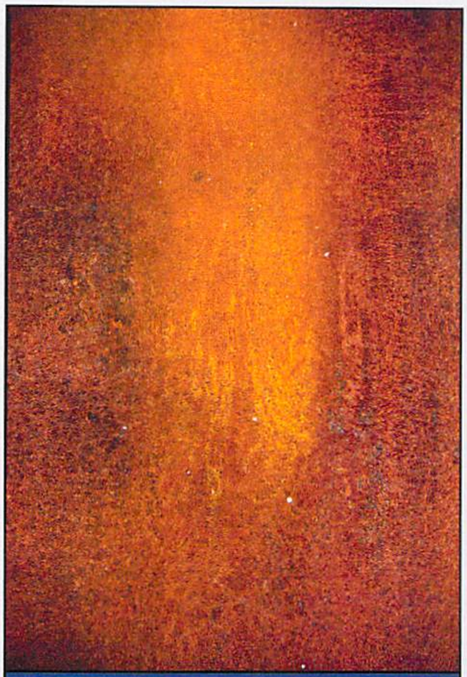


FIGURE 03 VIEW OF ORIGINAL RUST TEXTURE

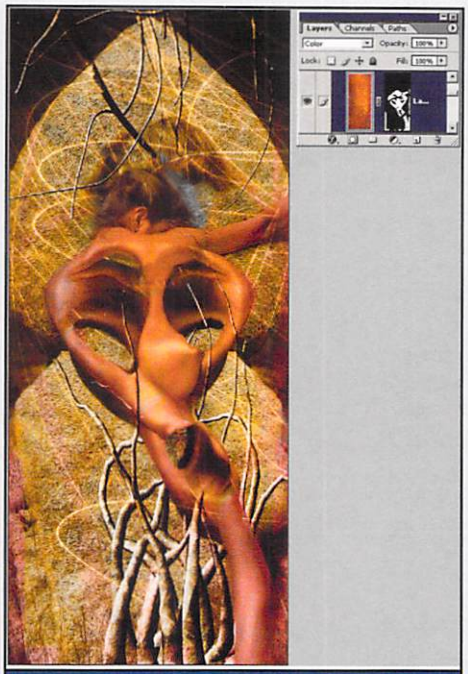


FIGURE 32 RUST TEXTURE IS APPLIED TO THE FIGURE

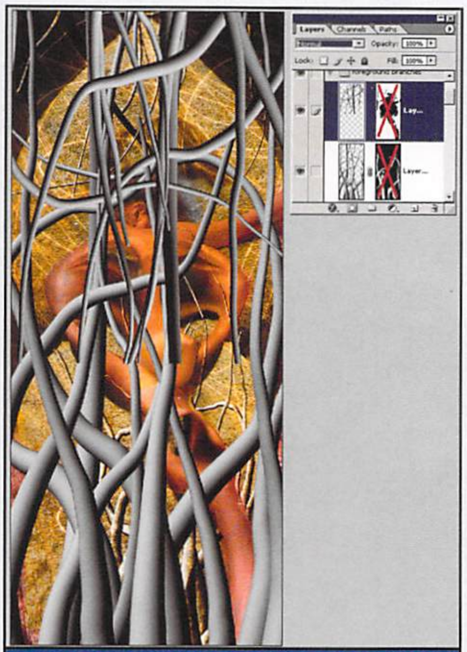


FIGURE 33 A NEW RENDER OF THE ROOTS ARE PLACED IN A NEW LAYER

Color, which simply took the colors in the rust image and applied them to the nude below it. Once again a mask is applied to restrict the effects to the figure. *(Figures 03 & 32)*

STEP 4

After viewing the current results I felt the background could take on a more aggressive nature so I placed another version of the roots in a new layer over the body as shown in figure 33. Afterwards the layer's blend mode is set to Overlay to give them a transparent like blend with the other textures as figure 34 shows.

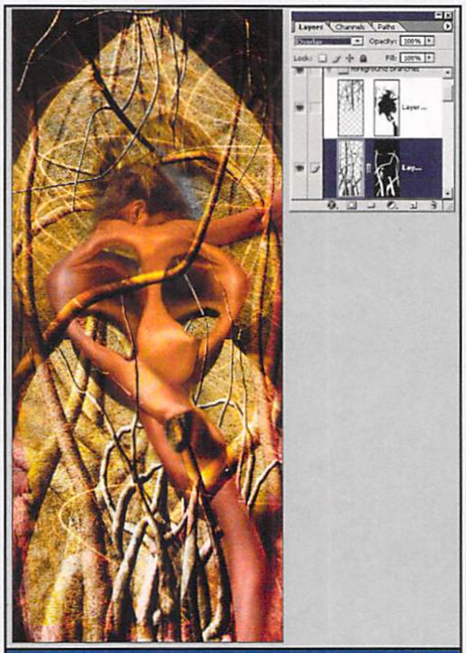


FIGURE 34 THE NEW ROOTS LAYER BLEND MORE IS SET TO OVERLAY

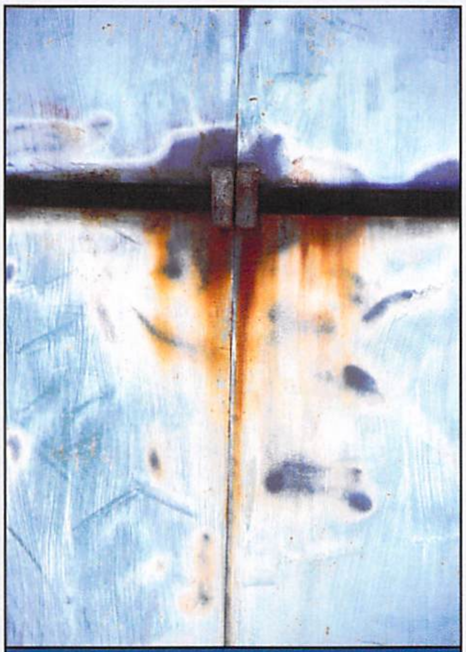


FIGURE 02 ORIGINAL IMAGE USED FOR THE FRAME

ADDING THE FRAME

The current image has all of the basic elements needed for its completion and later on it will be fine tuned but for now let's give this image a frame.

STEP 1

The frame that I chose to use was a shot of an old weather-torn door. I loved the rusted look of the latch bolt because it would work well with the use of the rusted texture originally used for the nude. The door was placed and resized so that the latch rested in the upper portion of the frame. Using the Eraser tool, the interior was discarded, allowing us to see the figure inside. Finally, a layer mask is applied and edited so that the root on the left side can appear to be on top of the frame.

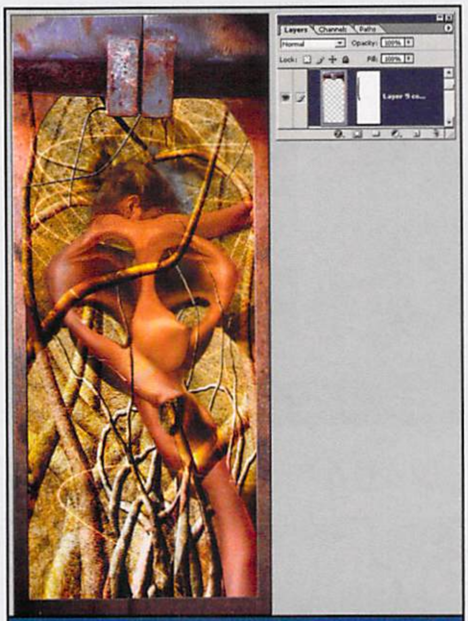


FIGURE 35 FRAME APPLIED

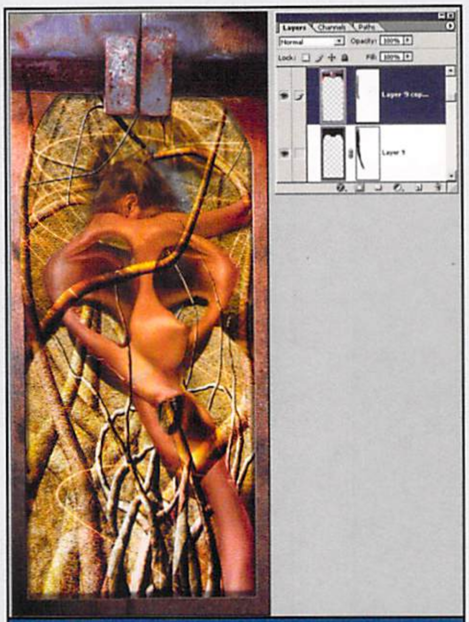


FIGURE 36 FRAME SHADOW APPLIED

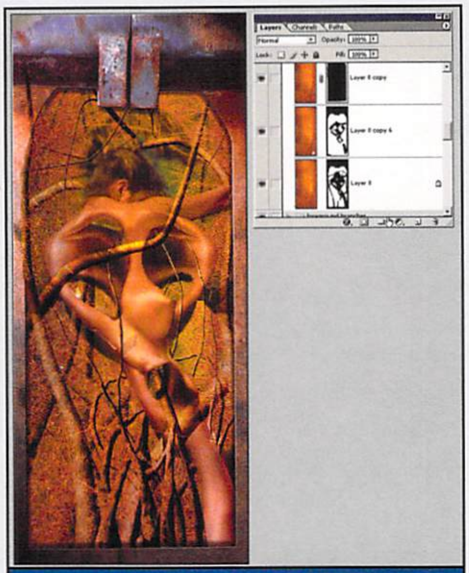
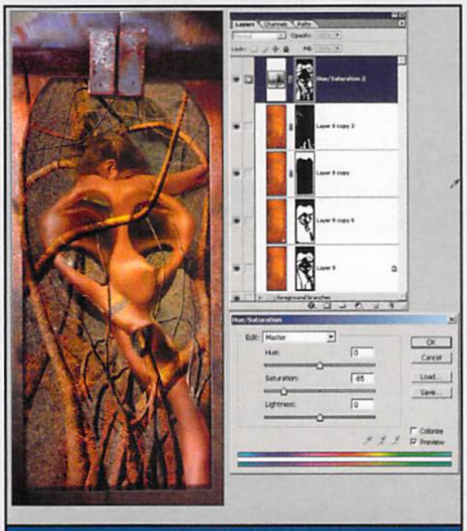


FIGURE 37 MORERUST IS APPLIED



Edit: Master
Hue: 0
Saturation: -65
Lightness: 0

FIGURE 38 HUE & SATURATION ADJUSTMENT LAYER IS APPLIED

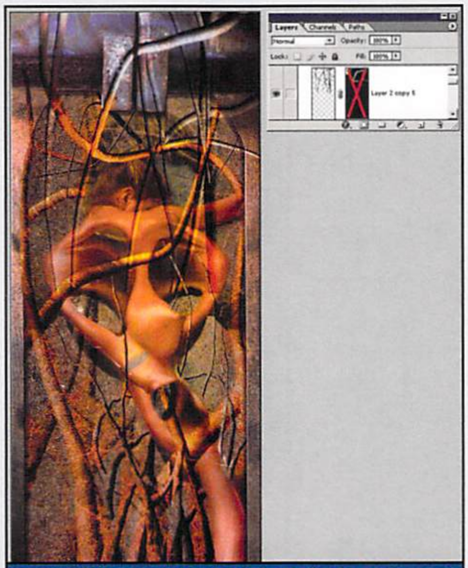


FIGURE 39 ADDITIONAL ROOTS ADDED

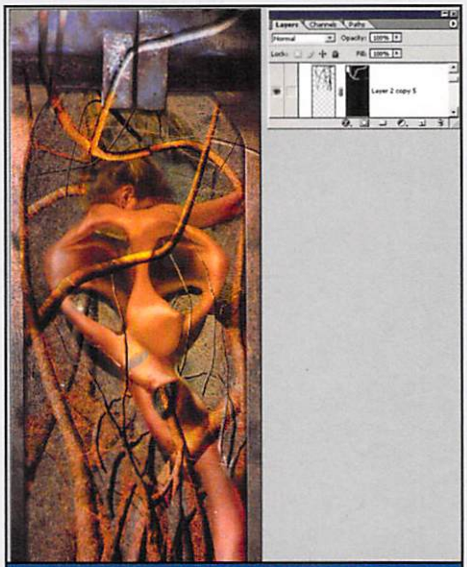


FIGURE 40 ADDITIONAL ROOTS WITH MASK APPLIED

STEP 2

Moving forward, the door layer is duplicated (Ctrl-J) and filled with black (Edit>Fill>Fill with black). Gaussian Blur (Filter>Blur>Gaussion Blur) is used to soften the edges, because shadows usually have a soft look to them. Next, the layer's Opacity is lowered to around 50% so that we can see through it . Finally, this layer is placed beneath the door to give the appearance that it is lifted in front of the figure. *(Figure 36)*

STEP 3

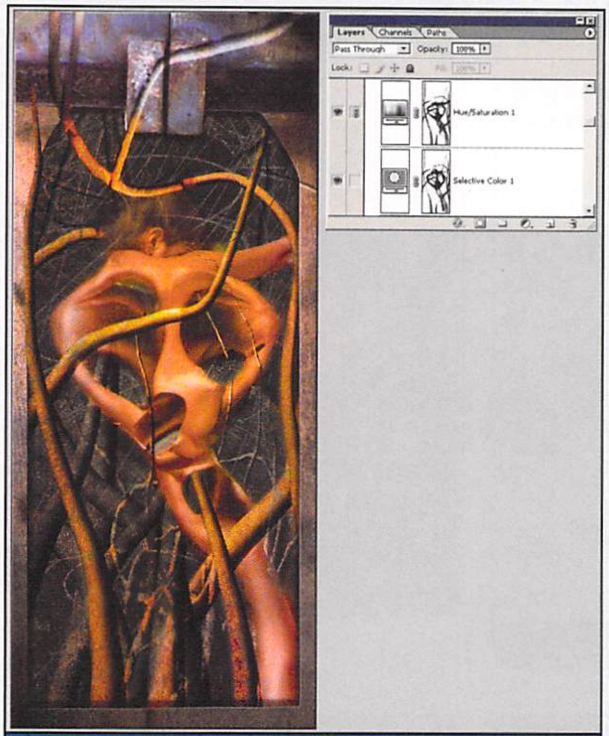
At this stage, the image suggests a theme of degradation, so to continue on this path, the rust texture is used again to blend with both the background and the frame. Several layers are used to achieve this, and each one is masked so that the effect only occurs on the background and the frame. *(Figure 37)*

STEP 4

The background areas around the roots and figure needed to be desaturated. A Hue & Saturation Adjustment Layer is applied and masked accordingly. *(Figure 38)*

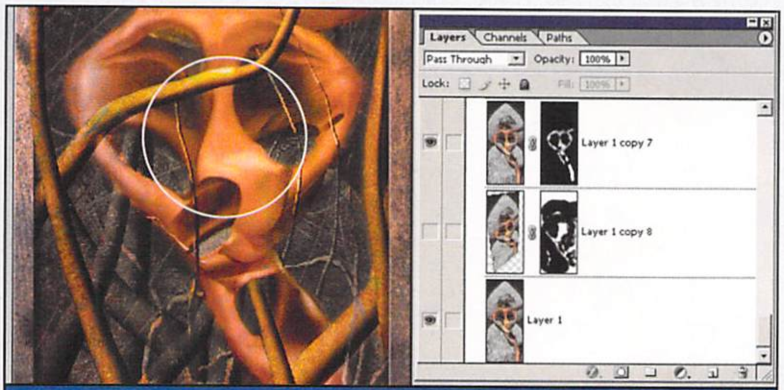
STEP 5

To gain a greater sense of depth, more of the 3D roots are applied to the upper portion of the frame. Next, a mask is applied and edited to allow the figure to remain dominant. *(Figures 39 & 40)*


Layers
Channels
Paths
Lock:
Fill:
Hue/Saturation 1
Selective Color 1

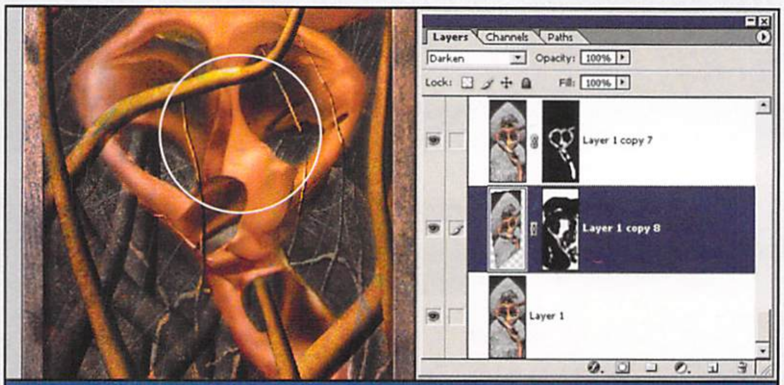
Pass Through
Opacity: 100%

FIGURE 41 BACKGROUND DESATURATED


Layers
Channels
Paths
Lock:
Fill: 100%
Layer 1 copy 7
Layer 1 copy 8
Layer 1

Pass Through
Opacity: 100%

FIGURE 42 ORIGINAL DETAIL


Layers
Channels
Paths
Lock:
Layer 1 copy 7
Layer 1 copy 8
Layer 1

Darken
Opacity: 100%
Fill: 100%

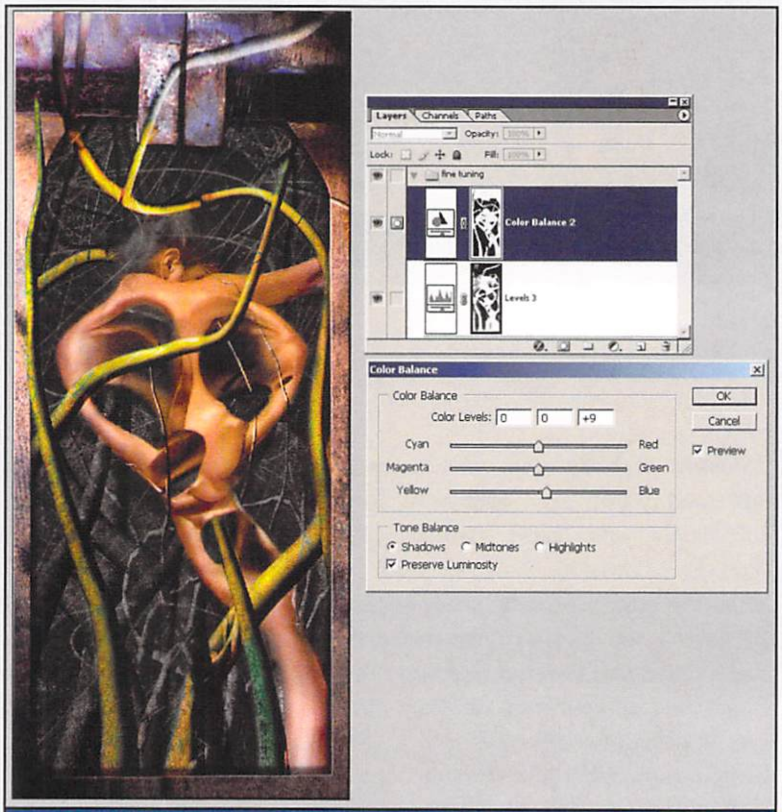
FIGURE 43 ADDED DETAIL

STEP 6

Now this is where the background is given its own character. At this stage, the background is a composite of a variety of colors and energetic textures. Two Adjustment Layers are added for the sole purpose of neutralizing out the color. The Hue & Saturation Adjustment Layer desaturates the background and the Selective color gives some richer density. *(Figure 41)*

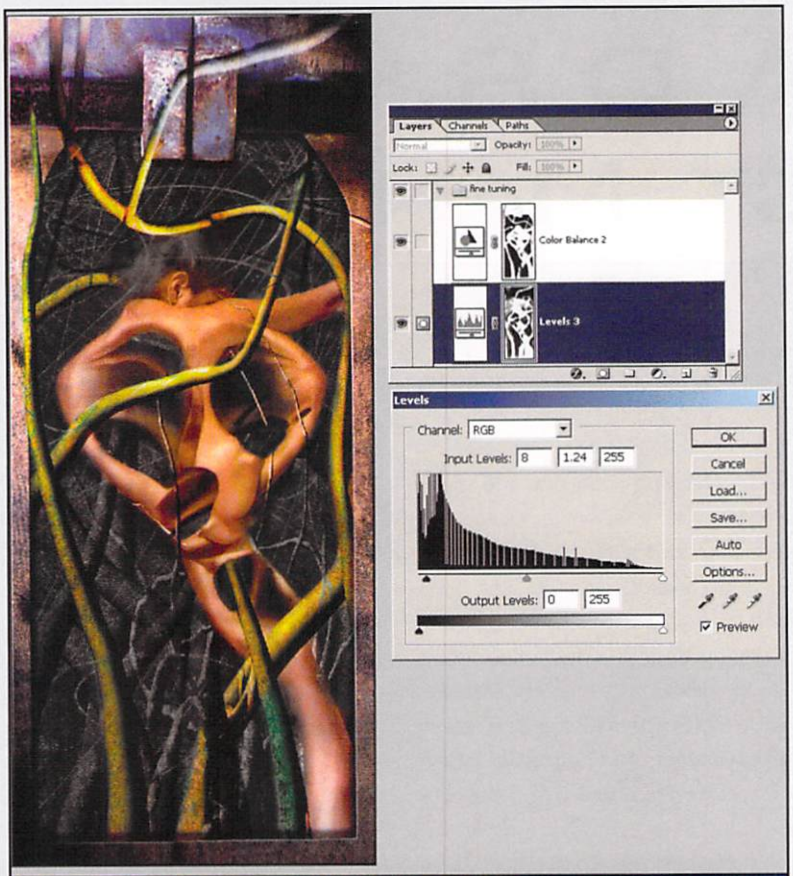
STEP 7

It's starting to take shape quite nicely, but I added some extra detail to the nude. In essence, the original morphed nude is duplicated and distorted *(Edit>Transform>Distort)* and its blend mode is set to Darken. I only wanted to affect a small area, so most of the layer is masked out. Figure 42 and 43 shows a before and after example.


Layers
Channels
Paths
Normal
Opacity: 100%
Lock:
Fill: 100%
fine tuning
Color Balance 2
Levels 3
Color Balance
OK
Cancel
Cyan
Red
Magenta
Green
Yellow
Blue

Color Balance
Color Levels: 0 0 +9
Tone Balance
● Shadows ○ Midtones ○ Highlights
☑ Preserve Luminosity
☑ Preview

FIGURE 44 ADJUSTMENT LAYER



Normal

Opacity: 100%

Fill: 100%

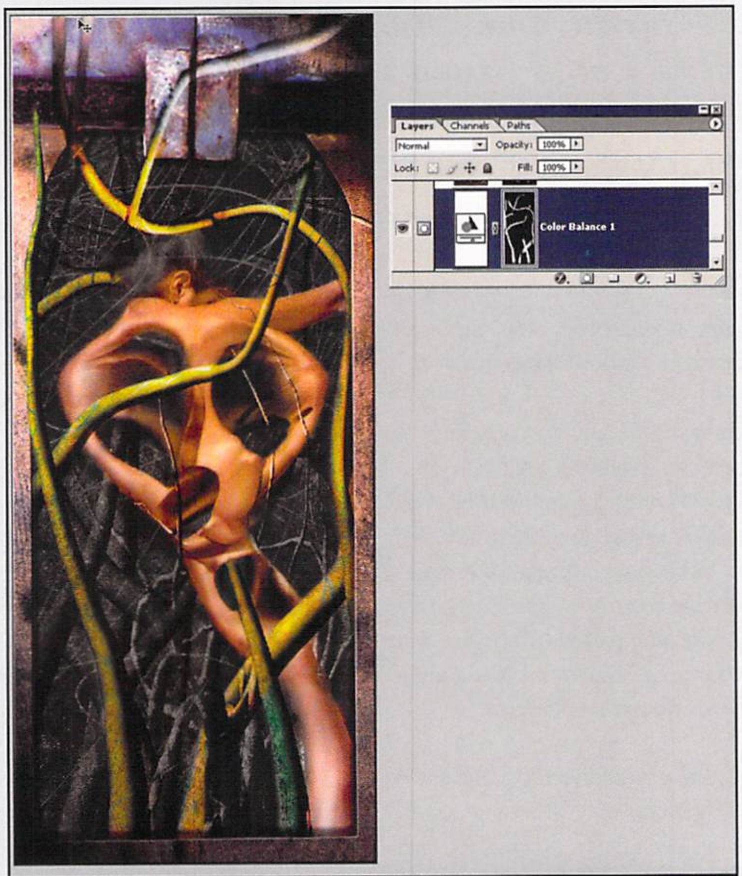
Channel: RGB

Input Levels: 8 1.24 255

Output Levels: 0 255

☑ Preview

FIGURE 45 ADJUSTMENT LAYER



Normal

Opacity: 100%

Fill: 100%

FIGURE 46 ADJUSTMENT LAYER

STEP 8

Figure 44, 45, and 46 are examples of Adjustment Layers with masks to not only fine-tune the image so that the roots color is altered to separate it from the rest of the image, but also to deepen the tonality of the neutralized background.

That's it. There is no right or wrong way to create as a fine artist. The bottom line is that the product honors the vision of the creator. If you experiment regularly, you can be exposed to endless possibilities of expressing your creative vision. I hope you enjoyed this article. If you would like to see more of my work, please visit my site at www.chromeallusion.com

Enjoy.

STEPHEN BURNS HAS DISCOVERED THE SAME PASSION FOR THE DIGITAL MEDIUM AS HE HAS FOR PHOTOGRAPHY AS AN ART FORM. HIS BACKGROUND BEGAN AS A PHOTOGRAPHER 22 YEARS AGO AND IN TIME, PROGRESSED TOWARD THE DIGITAL MEDIUM. STEPHEN HAS BEEN A CORPORATE INSTRUCTOR AND LECTURER IN THE APPLICATION OF DIGITAL ART AND DESIGN FOR THE PAST 8 1/2 YEARS. HE HAS BEEN EXHIBITING DIGITAL FINE ART INTERNATIONALLY AT GALLERIES SUCH AS DURBAN ART MUSEUM IN SOUTH AFRICA, CITIZENS GALLERY IN YOKAHAMA, JAPAN, AND CECUT MUSEUM OF MEXICO TO NAME A FEW. PART OF HIS EXHIBITING WON HIM 1ST PLACE IN THE PRESTIGIOUS SEYBOLD INTERNATIONAL DIGITAL ARTS CONTEST. OWNER OF BURNS DESIGN, HE TEACHES DIGITAL MANIPULATION WORKSHOPS IN THE SAN DIEGO AREA AND NATIONWIDE. HIS TEACHING STYLE COMES FROM HIS ABILITY TO SHARE AN UNDERSTANDING OF PHOTOSHOP SO THAT THE STUDENT HAS THE ABILITY TO INTUITIVELY APPLY IT TO HIS/HERS CREATIONS.

BY DEUCE BENNETT

SPREADSHEET
PROJECT MANAGER

Welcome back. I have a different type of information to pass on this month. There are those of us in the CGI industry that work at studios as a modeler, texture painter, animator, compositor, or any other position. This article isn't really for you at this point in your career, but it might be later. This is more for those of you who plan to hang your shingle out as a freelancer or start your own studio. There's something very important you must learn, and that's what I want to talk you about.

So, you have managed, by some method, to get a prospective client for your animation business. You might then hear the fabled words – "How much will it cost me to make a one minute animation?" What he's really asking for is your 'rule of thumb' to price his project. At Creative Imagineering, in our experience, the only 'rule of thumb' that you can and should answer is your hourly rate. Don't understand? OK, then visualize this. Picture the amount of work it would be to do one minute of a logo animation. Just a logo flying around the screen with a few moving shapes in the background. Now imagine the amount of work to do one minute of the battle for Helm's Deep in *Fellowship of the Ring*. Both of these are easily classified as computer animation, but wholly different amounts of work. When someone asks you "How much will it cost me to do my animation," the first question you should ask is to see a script or storyboard. You cannot and should not answer with any kind of budget without seeing, at the least, a "script synopsis." It is from this that you can see what is going to be involved in the project. Clients have a nasty habit of getting you to lock into a budget, then telling you what all is involved. Projects always grow; they never shrink.

The job of producing animation and video projects requires many skills. It is not enough to be skilled in modeling, lighting, surfacing, animating and compositing. You also have to be good at estimating, scheduling, pricing, and keeping track of a myriad of details involved in the production. Business skills are as essential in this business as any other. Most small studios like ours can't afford to pay a salary for specialty positions like Producers or Production Coordinators. This lack can adversely affect profits and deadlines.

> *CGI is fun, but it's even more fun when it's profitable. Utilizing spreadsheets could make the difference between a profitable job and an expensive lesson.*

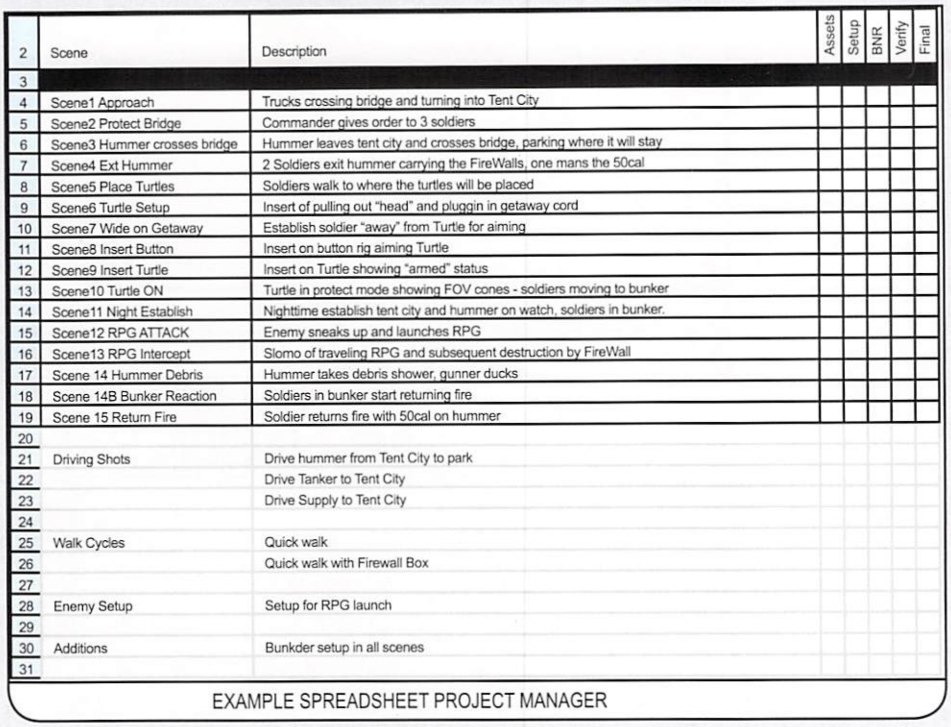
The way I look at it, you don't make your money when you're busting your buns in a late-night rush to finish by the deadline. You make it when you bid the job realistically, allowing for last minute changes and re-renders. We all have bad memories of a job that we underbid for one reason or another that caused us to lose money instead of making a profit. Those are not career builders.

We at Creative Imagineering, Inc. have evolved a technique that aids us in every step of a project, from pricing to final rendering, that we just have to share. If only some of you find this helpful, it will be worth the time and space of this article. It arose out of the process we used when we were doing physical special effects for movies. We always made checklists. This began when we did our script breakdown and aided in figuring our budgets and lists of expendables, additional manpower and rentals.

We call all modeled objects, images, surface textures, sets, landscapes, and set dressings "assets." Generating assets can be as much as 70% of a project, so realistic estimations of time to create assets are critical. It is true of scene creation, rendering submission, and proofing of renders. We evolved this over a period of about three years and about twenty projects.

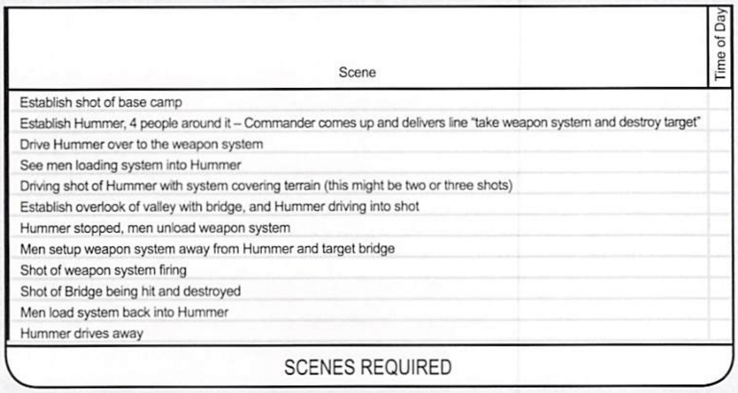
When we get a storyboard, we begin by imagining all the shots that are implied by the action shown and the reading time of the script dialogue, if any. We talk these through aloud while timing them each with a stopwatch. Estimating the length, in seconds, of each constituent piece gives us an educated guess as to the running time of the project.

Next, we list all the assets necessary for each scene. Then we consider which of the assets we already have. If these assets were not generated for the client at hand, we add some development cost for their use. After all, these are our work and we have a right to benefit from bringing them to the project. This also protects us from underestimating the production of other assets that may be more complex than we could know at this point. Then, we guestimate the man-hours for creating each asset, or the cost of acquisition if the asset can be acquired.



2	Scene	Description	Assets	Setup	BNR	Verify	Final
3							
4	Scene1 Approach	Trucks crossing bridge and turning into Tent City					
5	Scene2 Protect Bridge	Commander gives order to 3 soldiers					
6	Scene3 Hummer crosses bridge	Hummer leaves tent city and crosses bridge, parking where it will stay					
7	Scene4 Ext Hummer	2 Soldiers exit hummer carrying the FireWalls, one mans the 50cal					
8	Scene5 Place Turtles	Soldiers walk to where the turtles will be placed					
9	Scene6 Turtle Setup	Insert of pulling out "head" and pluggin in getaway cord					
10	Scene7 Wide on Getaway	Establish soldier "away" from Turtle for aiming					
11	Scene8 Insert Button	Insert on button rig aiming Turtle					
12	Scene9 Insert Turtle	Insert on Turtle showing "armed" status					
13	Scene10 Turtle ON	Turtle in protect mode showing FOV cones - soldiers moving to bunker					
14	Scene11 Night Establish	Nighttime establish tent city and hummer on watch, soldiers in bunker.					
15	Scene12 RPG ATTACK	Enemy sneaks up and launches RPG					
16	Scene13 RPG Intercept	Slomo of traveling RPG and subsequent destruction by FireWall					
17	Scene 14 Hummer Debris	Hummer takes debris shower, gunner ducks					
18	Scene 14B Bunker Reaction	Soldiers in bunker start returning fire					
19	Scene 15 Return Fire	Soldier returns fire with 50cal on hummer					
20							
21	Driving Shots	Drive hummer from Tent City to park					
22		Drive Tanker to Tent City					
23		Drive Supply to Tent City					
24							
25	Walk Cycles	Quick walk					
26		Quick walk with Firewall Box					
27							
28	Enemy Setup	Setup for RPG launch					
29							
30	Additions	Bunkder setup in all scenes					
31							

EXAMPLE SPREADSHEET PROJECT MANAGER



Scene	Time of Day
Establish shot of base camp	
Establish Hummer, 4 people around it – Commander comes up and delivers line "take weapon system and destroy target"	
Drive Hummer over to the weapon system	
See men loading system into Hummer	
Driving shot of Hummer with system covering terrain (this might be two or three shots)	
Establish overlook of valley with bridge, and Hummer driving into shot	
Hummer stopped, men unload weapon system	
Men setup weapon system away from Hummer and target bridge	
Shot of weapon system firing	
Shot of Bridge being hit and destroyed	
Men load system back into Hummer	
Hummer drives away	

SCENES REQUIRED

Next, we evaluate the amount and complexity of the animation required for each shot. Again we try to estimate the man-hours needed to accomplish each animation. This is a bad time to be too optimistic in how fast you can turn out a shot. (Remember all the times a "simple" animation took twice or three times what you thought it would?)

When figuring the amount of render time, don't forget to triple the estimate to cover half-res test renders and the inevitable re-renders. If your scenes involve high overhead effects, like Hypervoxels and volumetrics, be sure to allow for extra render time.

We used to organize all these elements on a sheet of paper divided into graph sections and wrote in times, man-hours, and magic-marker completed operations. One day it occurred to me that I could more easily create and modify it in a spreadsheet program. A bonus discovery was how easily I could set up automatic calculations to extract data without having to grab a calculator.

Here is the basic setup (Shown Above) we use now for production. It is easily customizable for whatever you may want to do with it.

Now, let's walk through a fictional project to see how we develop the estimating chart, and how that develops the production chart.

Client says that he has a project that will be about one minute in length. You ask for a script or a storyboard (remember, this is prime rule number one). He says that he doesn't have a storyboard or script, but he does say that he has a basic "storyline idea" for the project. You say fine, email it over.

First thing you do is read through it, and make a list of questions. Here is a an example 'storyline idea' for a military-based project.

At a base camp, the order comes in to deploy the new weapon system.

The weapon is loaded onto the back of a Hummer, and it requires three people to use it.

The Hummer is driven to an area that overlooks a valley, showing a bridge.

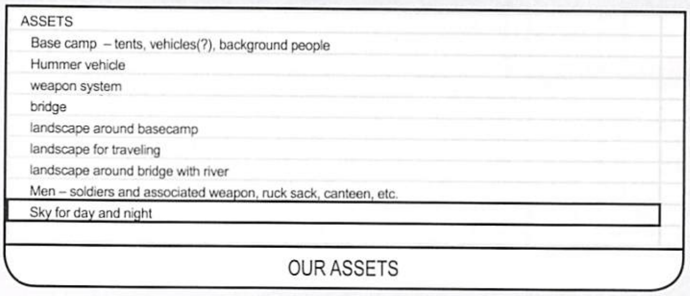
The weapon is unloaded and set up - and is fired, taking out the bridge.

The weapon is loaded back into the Hummer and driven back to the base camp.

NOTES: Only three people can carry the weapon, and the mission takes place at night.

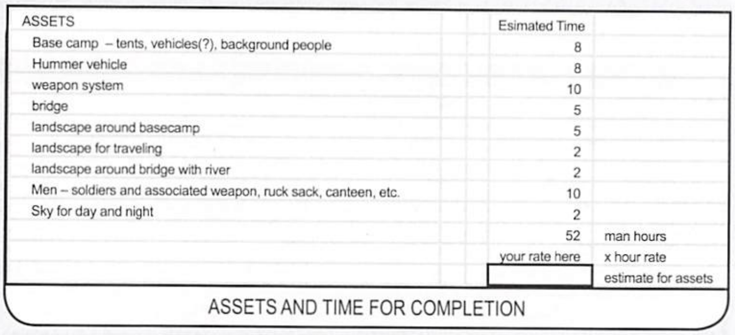
OK. A few questions might come up here that you will need to ask your client. The base camp – is this an established camp or is it just a few vehicles? How big is it? How many people are here? Things like this. For our discussion, however, it's not really necessary; we'll just go with the flow. With this "sketch" in front of us, let's visualize the sequences necessary to tell this story. Here is where you can be creative, but remember, you are visualizing the work that you will be doing. The sequences might come out like this:

1. Establish shot of base camp
2. Establish Hummer, four people around it – Commander comes up and delivers line *"take weapon system and destroy target"*
3. Drive Hummer over to the weapon system
4. See men loading system into Hummer
5. Driving shot of Hummer with system covering terrain (this might be two or three shots)
6. Establish overlook of valley with bridge, and Hummer driving into shot
7. Hummer stopped; men unload weapon system
8. Men set up weapon system away from Hummer and target bridge
9. Shot of weapon system firing
10. Shot of Bridge being hit and destroyed
11. Men load system back into Hummer
12. Hummer drives away



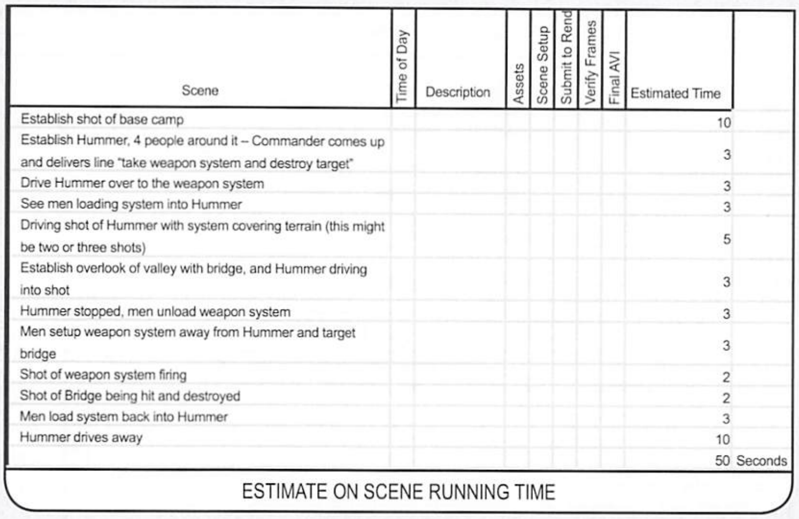
ASSETS
Base camp – tents, vehicles(?), background people
Hummer vehicle
weapon system
bridge
landscape around basecamp
landscape for traveling
landscape around bridge with river
Men – soldiers and associated weapon, ruck sack, canteen, etc.
Sky for day and night

OUR ASSETS



ASSETS	Esimated Time	
Base camp – tents, vehicles(?), background people	8	
Hummer vehicle	8	
weapon system	10	
bridge	5	
landscape around basecamp	5	
landscape for traveling	2	
landscape around bridge with river	2	
Men – soldiers and associated weapon, ruck sack, canteen, etc.	10	
Sky for day and night	2	
	52	man hours
	your rate here	x hour rate
		estimate for assets

ASSETS AND TIME FOR COMPLETION



Scene	Time of Day	Description	Assets	Scene Setup	Submit to Rend	Verify Frames	Final AVI	Estimated Time	
Establish shot of base camp								10	
Establish Hummer, 4 people around it – Commander comes up and delivers line "take weapon system and destroy target"								3	
Drive Hummer over to the weapon system								3	
See men loading system into Hummer								3	
Driving shot of Hummer with system covering terrain (this might be two or three shots)								5	
Establish overlook of valley with bridge, and Hummer driving into shot								3	
Hummer stopped, men unload weapon system								3	
Men setup weapon system away from Hummer and target bridge								3	
Shot of weapon system firing								2	
Shot of Bridge being hit and destroyed								2	
Men load system back into Hummer								3	
Hummer drives away								10	
								50	Seconds

ESTIMATE ON SCENE RUNNING TIME

Now, I would enter these into my spreadsheet form as shown above right.

Here I feel it necessary to discuss one primary difference between "Movie/Video Lingo" and CGI programs. In a CGI program, you load in assets, put things together, etc., and save what is called a "Scene File." Now, if you have another angle that you wish to render in that same file, you could move your camera and save out another "Scene File" – however, that would, in film terms, be a "Shot" in that "Scene." In film terms, a scene is a continuous block of storytelling either set in a single location or following a particular character. The end of a scene is typically marked by a change in location, style or time. A shot is a continuous block of unedited footage from a single point of view. Having this in mind means that you can break out the assets for a scene, knowing that you'll be reusing the same assets in multiple shots.

Next thing that I would do is break out a list of assets.

1. Base camp – tents, vehicles(?), background people
2. Hummer vehicle
3. weapon system
4. bridge
5. landscape around base camp
6. landscape for traveling
7. landscape around bridge with river
8. Men – soldiers and associated weapon, rucksack, canteen, etc.
9. Sky for day, and night

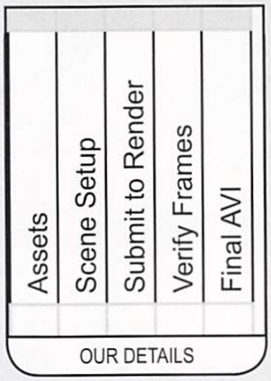
I would put these in a list at the bottom of our script breakout. *(Shown Above Left)*

This is what we will now use to estimate the creation of each asset and how long to set up the scenes/shots in question. We tend to use "man-hours" as our unit of measure. Here, you can see that these values have been put in for our estimating purposes. Now, by no means is this to be considered accurate – this is after all just an exercise. When you use this for your own, be honest and accurate for your own estimations. *(See example Top Right)*

From here, it's easy to set up a formula in a spreadsheet to add up our values, and multiply it by our hourly rate to get an estimation of the cost of this project. I always round up when reporting to the client, just for "slush" – you never know what will happen in the middle of a project, so it's best to try to plan for it. When estimating a project before it has been nailed down, by script and storyboard, it's always wise to bracket your estimate – meaning, don't say "$2500," say "somewhere between "$2500 and $3500" – that's what I mean by bracketing your estimate.

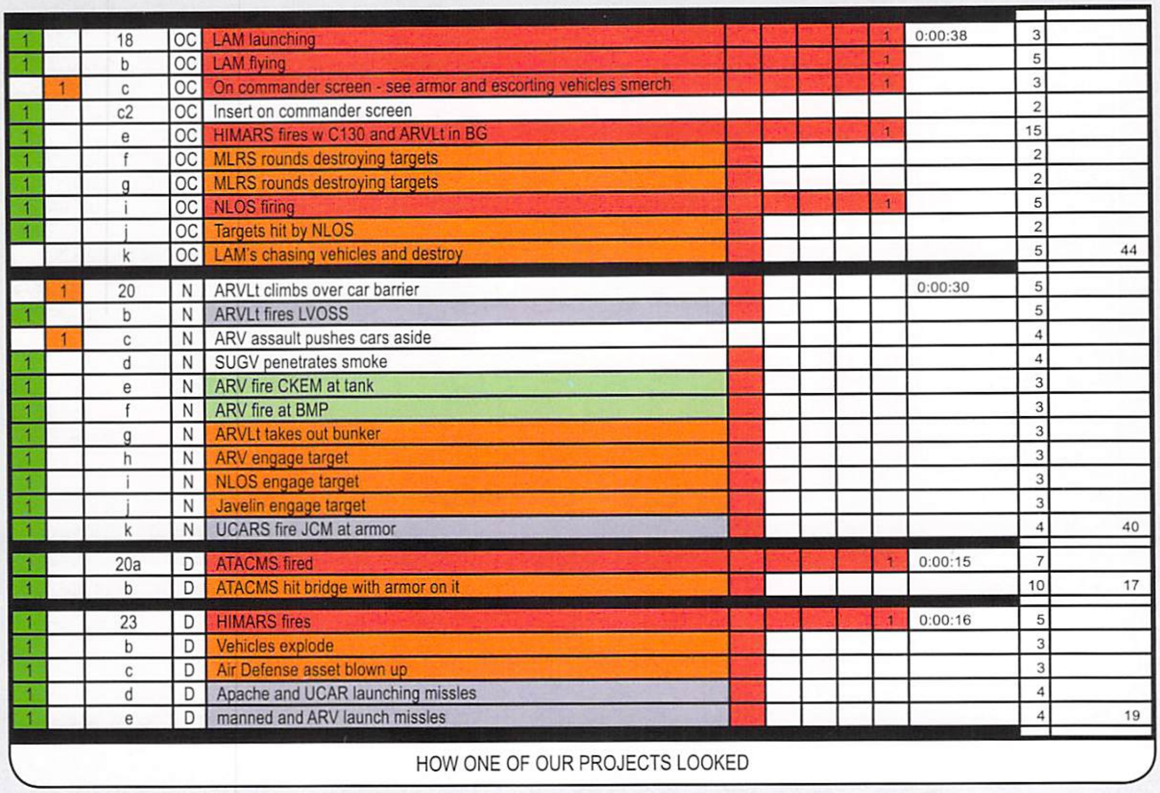
OK – with this information all easy to see, I'd do a "visual run-thru" with a stopwatch. What I do is simply close my eyes, start a stopwatch, and run the scenes one at a time in my head. I write the timing down in my "estimated run time" column. It's here that you might discover that your "estimated run time" for a project might be longer than your client's wish for a one-minute animation. If so, then you need to talk about this to see what he has in mind. Perhaps you have a scene or have a thought for an action that isn't needed that could shorten your project back down to the running time that is mutually agreed upon. This is the benefit of having this breakout of the project.

I went ahead and did that, and updated my columns. *(Above Lower Right)*



Assets	Scene Setup	Submit to Render	Verify Frames	Final AVI

OUR DETAILS



1		18	OC	LAM launching	🟥	🟥	🟥	🟥	1	0:00:38	3	
1		b	OC	LAM flying	🟥	🟥	🟥	🟥	1		5	
	1	c	OC	On commander screen - see armor and escorting vehicles smerch	🟥	🟥	🟥	🟥	1		3	
1		c2	OC	Insert on commander screen							2	
1		e	OC	HIMARS fires w C130 and ARVLt in BG	🟥	🟥	🟥	🟥	1		15	
1		f	OC	MLRS rounds destroying targets	🟥						2	
1		g	OC	MLRS rounds destroying targets	🟥						2	
1		i	OC	NLOS firing	🟥	🟥	🟥	🟥	1		5	
1		j	OC	Targets hit by NLOS	🟥						2	
		k	OC	LAM's chasing vehicles and destroy	🟥						5	44
	1	20	N	ARVLt climbs over car barrier	🟥					0:00:30	5	
1		b	N	ARVLt fires LVOSS	🟥						5	
	1	c	N	ARV assault pushes cars aside							4	
1		d	N	SUGV penetrates smoke	🟥						4	
1		e	N	ARV fire CKEM at tank	🟥						3	
1		f	N	ARV fire at BMP	🟥						3	
1		g	N	ARVLt takes out bunker	🟥						3	
1		h	N	ARV engage target	🟥						3	
1		i	N	NLOS engage target	🟥						3	
1		j	N	Javelin engage target	🟥						3	
1		k	N	UCARS fire JCM at armor	🟥						4	40
1		20a	D	ATACMS fired	🟥	🟥	🟥	🟥	1	0:00:15	7	
1		b	D	ATACMS hit bridge with armor on it	🟥						10	17
1		23	D	HIMARS fires	🟥	🟥	🟥	🟥	1	0:00:16	5	
1		b	D	Vehicles explode	🟥						3	
1		c	D	Air Defense asset blown up	🟥						3	
1		d	D	Apache and UCAR launching missles	🟥						4	
1		e	D	manned and ARV launch missles	🟥						4	19

HOW ONE OF OUR PROJECTS LOOKED

Now, providing that the client has now given the go ahead on our project, we modify our spreadsheet just a bit, and turn it into our production detail minder. This is where this method really shines. Keeping track of where you are, what needs to be done, and what has been done is of paramount importance so that you know what is going on! Here we use color to assist in "at a glance" progress indication. We use different colors to help in prioritizing certain scenes. We might use a color to call out "difficult" scenes, or scenes that require more work or specialized tools. All of this is at the user's discretion and should be worked to your own tastes and can even modify on a job-to-job basis. An example might be to use one color to indicate shots that require animation of people. Another might be to flag all scenes that require Hypervoxels, or even multi-pass rendering for compositing afterward. The things you need to take care of are up to you.

Here are the additional columns. *(Above Left)*

As each part of the chart gets marked off, you have a visual tally of where you are. As you get the necessary assets together and modeled and textured, you mark that off for all the scenes that are involved. The next thing is getting the scenes themselves set up and ready to go. Then you submit the scenes to rendering. Now, this will vary depending on your setup at your studio/room. We at Creative Imagineering, Inc. use ButterflyNetRender, so when we submit a scene to our BNR controller, we mark it off under the "submit to render" column. Then, the "verify frames" column comes into play. If no one has ever told you, you never, never render directly to an animation file. You render to frames, so you can fix small problems, or re-render bad frames. That is what this column is for. Here, once you have verified all frames, no dropped textures, no bad polygons, no flickering anything, mark it complete. Once all this is complete, most editing solutions can't handle sequences; it needs to be in AVI or some other format. Once you have done this, mark it done. *(Figure above right shows an example of a previous project.)*

I hope that you appreciate the simplicity of what has been outlined. Keeping track of even a small, project can be a large job. In selling your services, "the devil is in the details." Losing track of details can cause you to lose profit on the job. Doing CGI is fun, but it's even more fun if it's profitable.

JACK "DEUCE" BENNETT II IS A FREELANCE CGI ARTIST WITH A BACKGROUND IN PHYSICAL SPECIAL EFFECTS FOR MOTION PICTURES AND TELEVISION. DEUCE HAS BEEN WORKING IN THE FILM INDUSTRY HIS ENTIRE LIFE, AND HAS SUCH MOVIES AS *ROBOCOP, LONESOME DOVE, AND JIMMY NEUTRON: BOY GENIUS* TO HIS CREDIT, AS WELL AS TV SHOWS LIKE *WALKER, TEXAS RANGER*. DEUCE HAS BEEN USING COMPUTERS SINCE HE WAS 9, AND STARTED OFF WRITING HIS OWN GRAPHIC PROGRAMS. HE IS A UNIQUE COMBINATION OF PHYSICAL KNOWLEDGE AND VIRTUAL KNOW-HOW.

BY PETER RATNER

Surfacing
A HUMAN MODEL

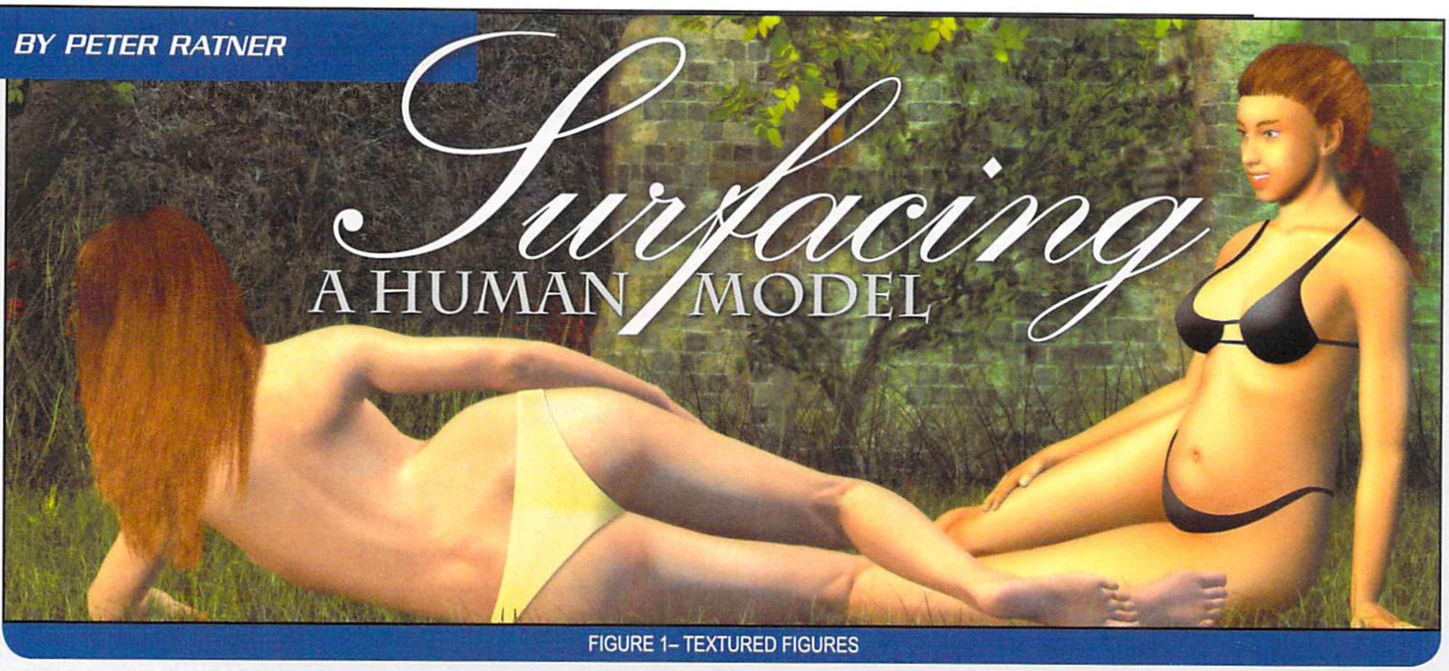


FIGURE 1– TEXTURED FIGURES

Surfacing a model is a very important part of the 3D process. Rather than spending a great amount of time modeling details, texturing them onto the object will not only reduce computer memory requirements but also will greatly improve your character's appearance *(Figure 1)*. When it is done right, the texture on the model becomes indistinguishable from the actual surface geometry.

Although there are a number of different ways to project an image onto an object, most of the time UV mapping is used for the precise placement of facial textures. Front projection mapping methods consisting of planar, cubic, cylindrical, and spherical types are based on simple primitive forms. These will work well for general overall textures or for simple shapes such as the spherical eyeball.

UV texture maps work well for irregular shapes. The texture maps are adhered to special points on the object. Since the placement of the texture can be assigned to specific parts of the object, the greatest control possible is now in the hands of the artist. UV mapping can be accomplished in several ways. One of the most common is to unroll and flatten the wire mesh and then paint or assign a texture to it in an image editing program. When the image is saved and assigned to the model, the texture conforms to its shape. Some tweaking will most likely have to be done in order to precisely fit the mesh points to the texture.

Another method is to use a special 3D paint program and actually paint the textures onto the object. When the object is saved the UV texture coordinate settings are saved, along with it, or the texture can be saved for spherical mapping.

UV MAPPING A HUMAN HEAD

The following tutorial will take you through the steps for creating UV maps from a head, painting the textures in Photoshop, and finally importing the textures into your 3D program. Since it is very difficult to show each step without referring to specific tools and menu items, this tutorial will refer to the way Maya does UV mapping. Since many 3D artists use Maya, it is the logical choice for this tutorial. If you are using a different 3D program, you should be able to adapt these instructions to its methodology by looking for comparable tools and menu items. If you plan to UV map an entire body that is one continuously connected object, then review the steps for the head, but follow the guidelines in the next section, titled, "UV Mapping an Entire Body."

STEP 1

Start with your low polygon model. There is no need to work with a high-resolution smooth mesh model, since it only makes it more complicated to select specific faces. If you are modeling using the smooth proxy method *(Polygons > Smooth Proxy)*, you can UV map the rough model (proxy mesh).

Before you make a smooth proxy mesh, select the faces that you will UV map for each individual part, such as the inside of the mouth, eye sockets, nostrils, and the remainder of the face. Assign each part a different shader. If you want to make a specular map, use a Blinn or Phong but not a Lambert shader. Name each shader with the part of the face that it was assigned to ("inside_mouth," "eye_sockets," "nostrils," and "face"). If you modeled the entire body, you can continue to assign different shaders to the various parts. If you already have a smooth proxy mesh then just delete it and make a new one after you assign all the shaders to the low resolution model.

Make the smooth proxy model and put it in its own layer. The smooth proxy mesh has the same shaders as the low polygon proxy mesh. This means that when you assign the UV textures to the shader for the face or any other part, the smooth proxy will also receive the same textures. Both the proxy and the smooth mesh models share the same UVs. Figure 2 shows the proxy and smooth mesh heads.

Working with *(Figure 2)* a low polygon count model (left) as opposed to a high resolution one (right). The UVs from the proxy (low polygon) mesh are shared with the smooth (high polygon count) mesh.

STEP 2

A duplicate model will now be made that can be changed without disturbing the original model. This should make it easier to

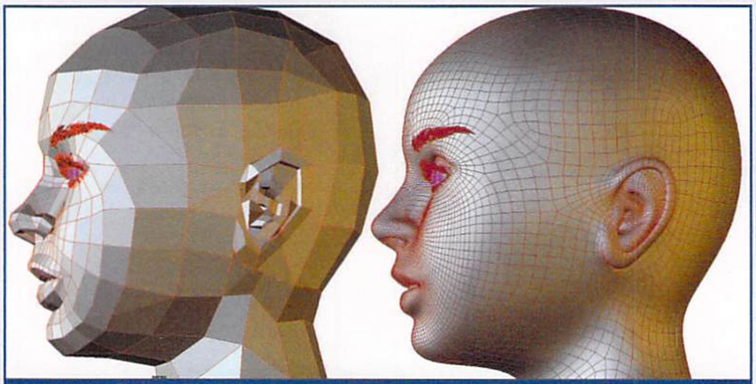


FIG. 2– WORKING WITH A LOW POLYGON COUNT MODEL (LEFT) AS OPPOSED TO A HIGH RESOLUTION ONE (RIGHT). THE UVS FROM THE PROXY (LOW POLYGON) MESH ARE SHARED WITH THE SMOOTH (HIGH POLYGON COUNT) MESH.

find faces that have a tendency to overlap on the UV map. The UVs will then be transferred from the duplicate to the original. Create a layer for the original head. Copy the head and paste it. Move the duplicate next to the original and make a layer for it. Hide the original head. If you have modeled an entire person, then duplicate the entire body, not just the head. The point count on the duplicate object has to be the same as the original one. This means you cannot add more faces or points to the original model after making the duplicate one.

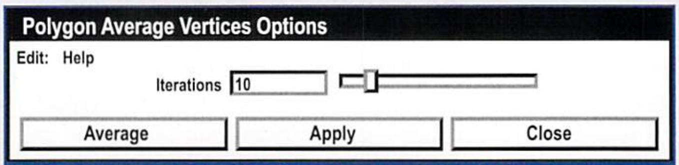
STEP 3

Open the Hypershade/Perspective views. Right-click on the shader that you assigned to the face only and pick "Select Objects With Material." This will select only the face polygons, not the inside of the mouth, eye sockets, and so on. In your perspective view, go to *Show > Isolate Select > View Selected.* Now only the face can be seen for the next step and UV mapping.

STEP 4

On the duplicate model, select the vertices on the areas that are the most complex such as the ears, lower part of the nose and nostril, the lips and around eyes. The inside of the mouth, eye sockets, and nostril faces are hidden and have different shaders assigned to them; therefore, they can be UV mapped separately. Each time you select the vertices of a specific area on the face, go to *Polygons > Average Vertices > Options* menu *(Figure 3).* Ten iterations should be enough, but you may have to perform this operation several times on some parts; therefore, you might want to make a shelf item for this command.

When you finish smoothing out specific areas of the face, select all the vertices of the entire duplicate head and perform another average vertices operation. Figure 4 shows the original head compared to its smoother duplicate after averaging the vertices. Most of the faces are more planar and less complex than those of the original head.



Polygon Average Vertices Options

Iterations 10

FIG. 3– AVERAGING THE VERTICES ON THE DUPLICATE HALF HEAD TO SMOOTH OUT SEVERE ANGLES ON THE POLYGONS

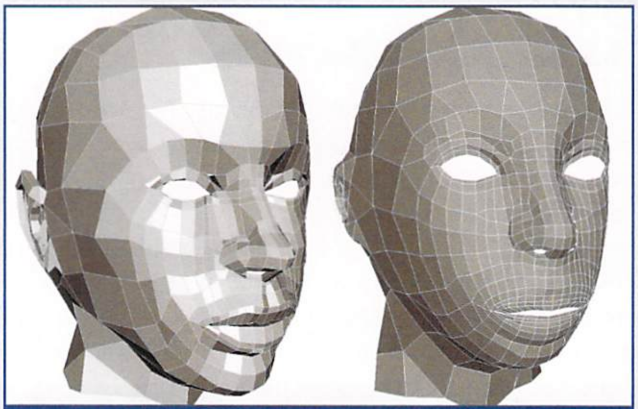


FIG. 4– THE DUPLICATE HEAD (RIGHT) AFTER AVERAGING ITS VERTICES

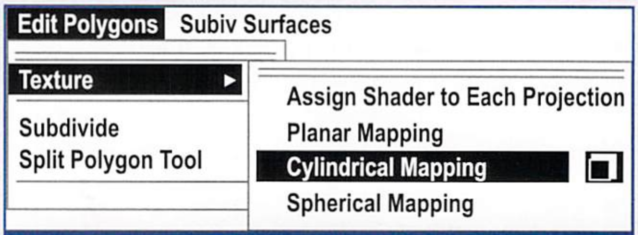
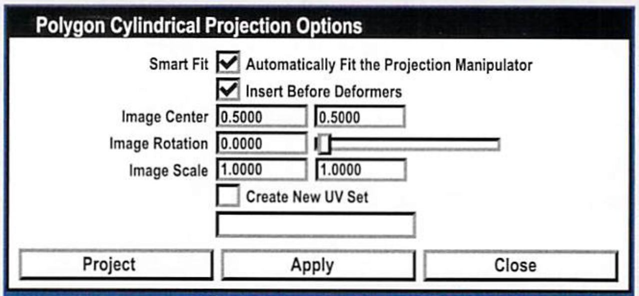


FIG. 5 OPENING THE CYLINDRICAL MAPPING OPTIONS BOX



Polygon Cylindrical Projection Options

Smart Fit ☑ Automatically Fit the Projection Manipulator
☑ Insert Before Deformers
Image Center 0.5000 0.5000
Image Rotation 0.0000
Image Scale 1.0000 1.0000
☐ Create New UV Set

FIG. 6 SETTINGS USED IN THE CYLINDRICAL MAPPING OPTIONS BOX

STEP 5

Now it is time to use Cylindrical UV Mapping on the duplicate head. Select the averaged duplicate head faces. You can do this easily by going again to the Hypershade window, right-clicking on the shader that you assigned to the face only, and picking "Select Objects With Material". Go to *Edit Polygons > Texture > Cylindrical Mapping > Options (Figure 5).* Use the settings shown in Figure 6 and click Project. You should now see a cylindrical outline around the duplicate head. Most of the time you will not have to do any editing using the cylindrical manipulators, but if you want to scale or move them, locate the diamond with a "T" inside it near the bottom of the cylindrical outline and click on it *(Figure 7)*. Use the arrows for translating and the cubes for scaling. Make sure that in the Attribute Editor (Control A) for the cylindrical projection, there is a setting of 180 degrees next to the Projection Horizontal Sweep. In order for you to see the newly created UV map you will have to go to *Window > UV Texture Editor... (Figure 8)*.

STEP 6

As one can see in Figure 9, the UV Texture is somewhat distorted in places, stretched on top of the head, and contains overlapping polygon faces in some areas. This means that parts of the face will now have be UV mapped separately and then later stitched together in the UV Texture Editor. In the UV Texture Editor, right-click and select UV. Draw a selection box around the entire UV mesh and move it to the side of the dark gray box. In the perspective window, press F8 and right-click to select Face. Select the faces for the top of the head only and go to *Edit Polygons > Texture > Planar Mapping > Options*. In the Planar Projection Options box, select Y-axis for the Mapping Direction and click Project. In the UV Texture Editor, your newly mapped polygons may look somewhat like those in Figure 10. Move these somewhere to the top of the UV Texture Editor window. They can be moved anywhere, but be careful not to place them where you moved the previously mapped cylindrical UVs.

STEP 7

Next, go back to the perspective window and select the neck polygon faces. Use cylindrical mapping for these *(Figure 5)*. In the UV Texture Editor, move the neck faces to the bottom of the window. Figure 11 shows the selected neck faces as they might appear in the UV Texture Editor and the perspective view.

STEP 8

Now that you have all the face polygons, you can easily select them by clicking on the model in any of the views and then opening the UV Texture Editor. It will show the faces laid out in three sections. You can select those faces by right-clicking in the UV Texture Editor and selecting "Face." Draw an outline around the faces in the UV Texture Editor. The faces should now be highlighted in your various view windows. In your perspective window panel, choose *Show > Isolate Select > View Selected*. This will hide everything except for the selected faces. To show everything again, choose *Show > Isolate Select > View Selected*.

Right-click in the UV Texture Editor and select UV. Scale all the separate groups so that they are somewhat proportional. You should now have separate UV mapped faces, such as the ones seen in Figure 12.

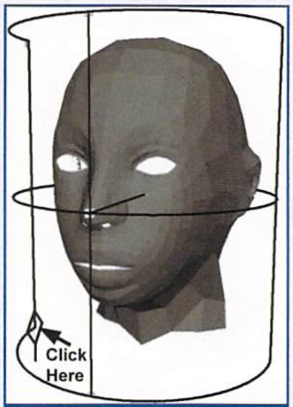


FIG. 7 THE CYLINDRICAL MAPPING MANIPULATORS

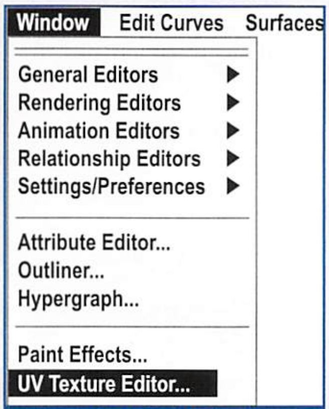


FIG. 8 ACCESSING THE UV TEXTURE EDITOR

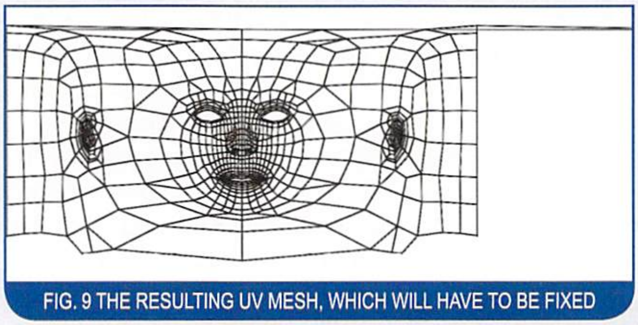


FIG. 9 THE RESULTING UV MESH, WHICH WILL HAVE TO BE FIXED

Color Map
Bump Map
Specular Map

FIG. 10 THE FACES ON THE TOP OF THE HEAD ARE PLANAR MAPPED ON THE Y-AXIS

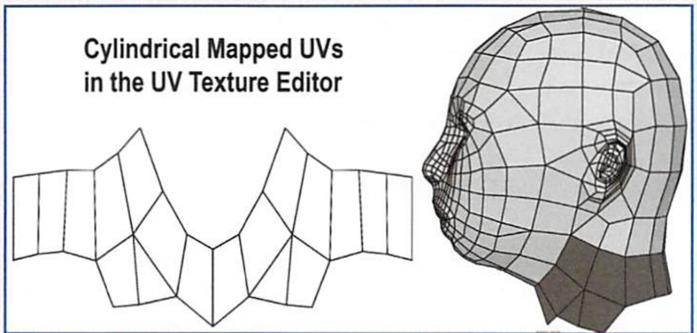


FIG. 11 THE FACES ON THE NECK ARE CYLINDRICALLY MAPPED

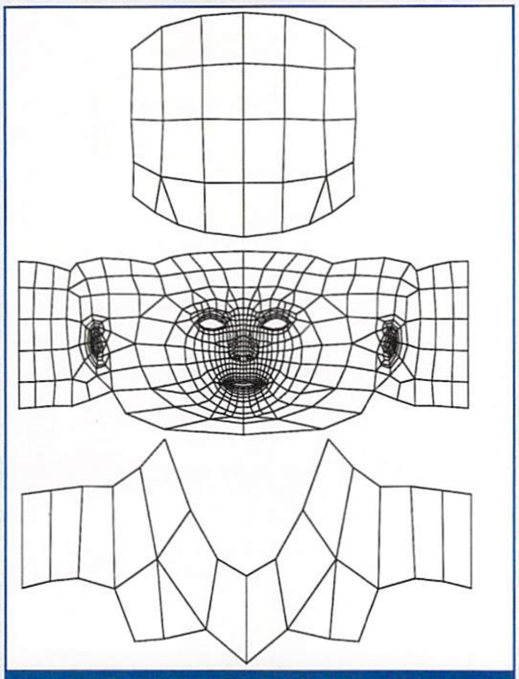


FIG. 12 THE SEPARATE GROUPS OF FACES FOR THE TOP OF THE HEAD, MOST OF HEAD, AND NECK

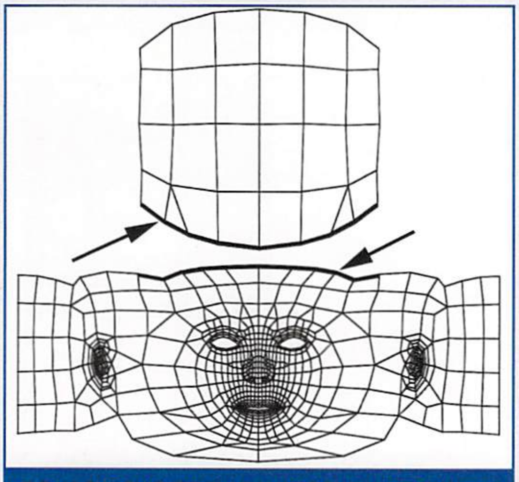


FIG. 13 THE THICKER BLACK LINES SHOW THE SHARED EDGES ON THE TOP AND THE REST OF THE HEAD. THESE WILL HAVE TO BE MOVED AND SEWN TOGETHER

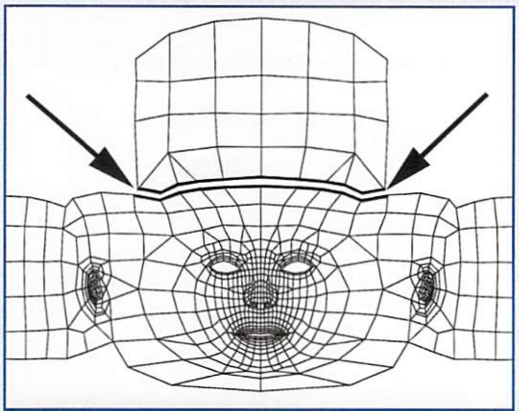


FIG. 14 MOVING THE TOP OF THE HEAD VERTICES IN PREPARATION FOR SEWING THE SHARED EDGES TOGETHER

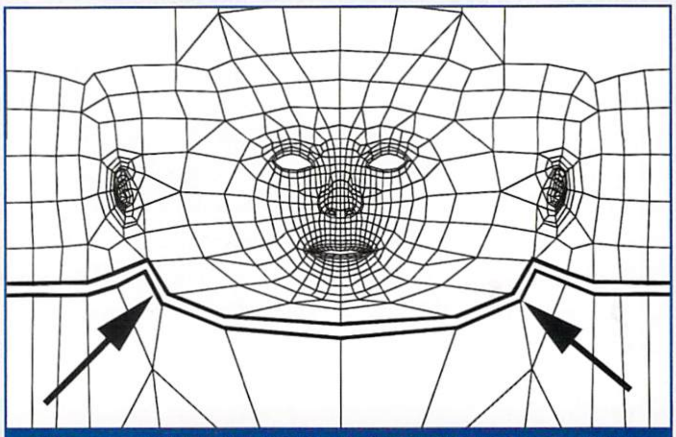


FIG. 15 AFTER SHIFT-SELECTING THE SHARED EDGES ON THE TOP OF THE HEAD, THEY ARE SEWN TOGETHER. THE NECK VERTICES (THICKER LINES) ARE THEN MOVED IN PREPARATION FOR SEWING TO THE HEAD

STEP 9

The separate groups will have to be moved and sewn together. In the UV Texture Editor, right-click to select Edges and check to see which edges are shared between the top of the head and the rest of it *(Figure 13)*. Right-click and select UV. Move the vertices of the top of the head faces so that they are closer to the corresponding ones on the rest of the head *(Figure 14)*.

STEP 10

Continuing our work in the UV Texture Editor, right-click and select Edges. Shift-select the shared edges belonging to the top of the head. This will automatically select the shared edges on the rest of the head. These are illustrated as thicker lines in Figure 14. In the UV Texture Editor, go to the Polygons menu and select Sew UVs. This will stitch the shared edges together, as seen in Figure 15. Move the vertices that are part of the neck closer to the rest of the face so that the shared edges line up somewhat like the ones in Figure 15. Shift-select the shared neck edges and go to *Polygons > Sew UVs*. Look for other areas on the head and the inside mouth and untangle the overlapping faces. The final UV map should now resemble the one in Figure 16. If you find that some faces are clumped together, then try going to *Polygons > Relax UVs,* but be careful because this could result in some stretching of your textures.

STEP 11

Select the entire UV mesh and move it into the top right one unit square (Figure 17). You will most likely have to scale the mesh to fit into the square. If you plan to UV texture the entire body that is connected to the head, then refer to Figure 23. The face UVs will only occupy a small section of the one unit square. The next section, titled "UV Mapping an Entire Body," explains this procedure.

Make sure that the head is selected by Object Type in the perspective view. It should not be in Component Type, such as when you are going to select vertices, edges, or faces. In the UV Texture Editor, go to the Polygons menu and select UV Snapshot. In the UV Snapshot box, use TIF (if you want to keep an Alpha channel of the UV lines) or JPEG for Image Format. Set your X and Y Size large enough so that your textures have a high enough image resolution - perhaps 1000 by 1000 if you are only texturing the head. Click the Browse button and save your file into your source images folder. Click OK to exit the UV Snapshot box.

STEP 12

Before you start painting your textures, you should transfer the UVs from the duplicate head to the original one. Make the original head visible so that you can see both of them. First, select the duplicate head, and then Shift-select the original head. Go to *Polygons > Transfer > Options.* In the Polygon Transfer Options box, UV Sets should be on. Click the Transfer button. Select only the original head and open the UV Texture Editor. You should see the identical UV map there. If the duplicate head has a different vertices count than the original then you could have problems transferring the UVs. You can now delete the duplicate head.

STEP 13

In Photoshop, open the file that you saved from the UV Snapshot box. The TIF or JPEG image will show up with white lines on a black background. Reverse this by going to *Image > Adjustments > Invert.* Duplicate this first layer. Use the Magic Wand tool to select only the white areas of the top layer. Make sure Contiguous at the top of your screen is off. Delete the white areas of the top layer. Select the bottom layer and fill it entirely with white. Create three more layers underneath the second layer. These will be the ones in which you will paint the color, bump, and specular image maps *(Figure 18).* The top layer is your template that will indicate the location of your textures when they are mapped on your model in Maya. When you paint your textures, make sure the appropriate layer is selected.

STEP 14

Paint the color image map. You can do this in several ways. Some prefer to just paint them from scratch while others will copy and paste and clone from a photograph. The template layer is your guide as far as where the lip, eye area, forehead, and so on are located. Create a bump map. This will just be a light grayscale image with most of the lines showing up the strongest on the lips. Make a specular map. This is also a grayscale image in which the light areas will appear shiny while dark areas more matte. You can invert the bump map and work from there. The color, bump, and specular images should be the same size with the different facial features located in the same areas. Save each map as a separate .jpg file. Figure 19 *(Next page)* illustrates the three maps for only the head.

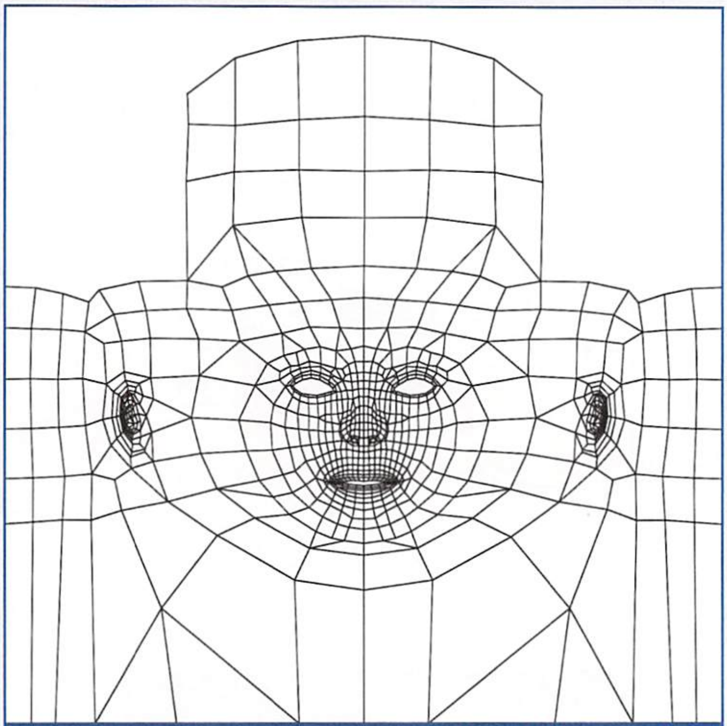


FIG. 16 THE SHARED EDGES ON THE NECK ARE ALSO STITCHED TOGETHER USING THE SEW UVS COMMAND.

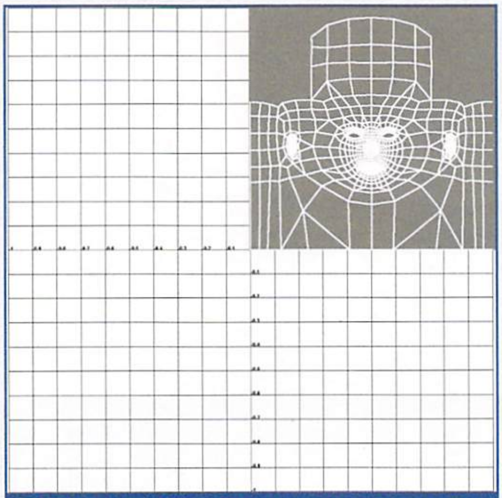
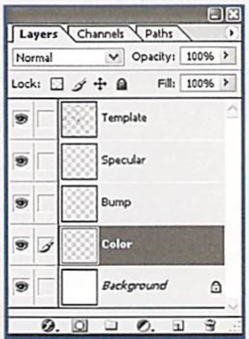


FIG. 17 THE ENTIRE UV MESH IS SCALED AND MOVED INTO A ONE UNIT SQUARE. IF YOU ARE UV TEXTURING AN ENTIRE BODY, THEN REFER TO FIGURES 10-23



Normal
Opacity: 100%
Lock:
Fill: 100%
Template
Specular
Bump
Color
Background

FIG. 18 THE IMAGE MAP LAYERS IN PHOTOSHOP

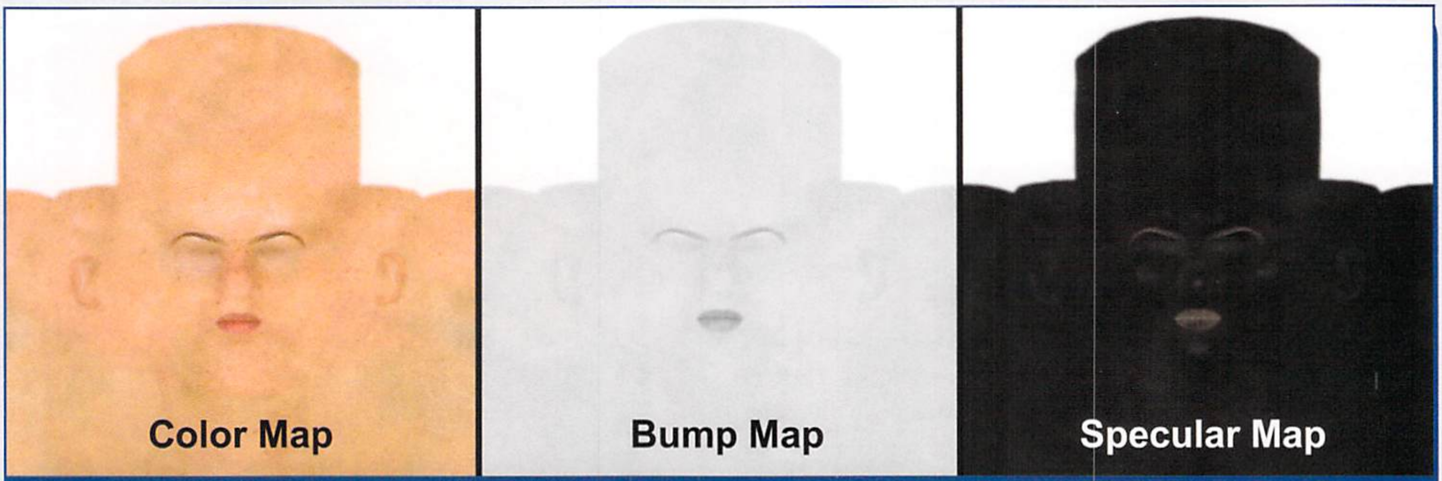


FIG. 19 THE HEAD COLOR, BUMP, AND SPECULAR IMAGE MAPS.

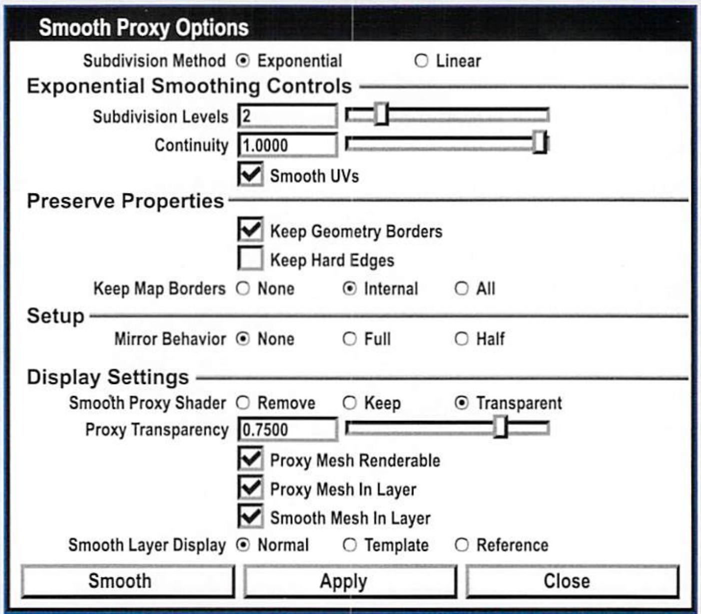
STEP 15

Back in Maya, select the low polygon head and bring up both the Hypershade and Perspective windows. In the bottom tab of your Hypershade window, double-click on the Blinn or Phong shader to bring up its attributes. Next to color, click the button, and from the Create Render Node window, select the File button under 2D Textures. Open the color image map that you saved from Photoshop. This will apply the color texture to the Blinn or Phong shader, and in turn, to your low polygon model.

In the Hypershade window, select the Blinn or Phong shader again and in its attributes, click the button next to Bump Mapping. In the Create Render Node window, select the File button under 2D Textures. Open the bump image map that you saved from Photoshop.

Select the Blinn or Phong shader again and in its attributes, under specular shading, select the button next to Specular Color. In the Create Render Node window, select the File button under 2D Textures. Open the specular image map.

You will most likely have to make some adjustments to your attribute settings for the bump and specular maps, and also in Photoshop to the three textures. Before you start, this you will first create a smooth version of your head, unless you already have a smooth proxy.



Smooth Proxy Options

Subdivision Method ● Exponential ○ Linear

Exponential Smoothing Controls

Subdivision Levels 2

Continuity 1.0000

☑ Smooth UVs

Preserve Properties

☑ Keep Geometry Borders

☐ Keep Hard Edges

Keep Map Borders ○ None ● Internal ○ All

Setup

Mirror Behavior ● None ○ Full ○ Half

Display Settings

Smooth Proxy Shader ○ Remove ○ Keep ● Transparent

Proxy Transparency 0.7500

☑ Proxy Mesh Renderable

☑ Proxy Mesh In Layer

☑ Smooth Mesh In Layer

Smooth Layer Display ● Normal ○ Template ○ Reference

FIG. 20 SETTINGS FOR THE SMOOTH PROXY HEAD.

STEP 16

If you already have a smooth proxy mesh, it will have the same shaders as the low polygon proxy mesh. You will not have to follow the instructions in the next paragraph.

Delete the history for your low polygon head to avoid any future error messages. Select the head and go to *Polygons > Smooth Proxy > Options*. Use the same settings as seen in Figure 20. The resulting smooth head should have the same UVs as the low polygon one. It

will also have the same Blinn or Phong shader with its image maps as the original low polygon head.

If you press 6 to see a textured view of your model in the perspective window it will show you how well the image maps fit. You should hide the layer with the low polygon model.

STEP 17

Whenever you find a crease in the center of your model or some of the color textures do not look right, go back to Photoshop and make your adjustments. Replace the old texture in Maya by selecting it in the bottom tab of the Hypershade window. It will be the one with the image. Double-click it to bring up the Attribute Editor, and under the image name, click the "Reload File Texture" button. Maya will update to the newer image. Make a rendering of the model to see what the textures really look like. It is also a very good idea to set up your lights right now. One of the first settings that should be adjusted is on the bump map. In the Hypershade view, locate the icon for the bump map. It will probably have a name like "bump2d1." Double-click this icon and in the Attribut Editor, adjust the Bump Value and the Bump Depth. In your Render View, set up the IPR (Interactive Photorealistic Rendering) renderer. You can now view your bump map adjustments interactively. After completing work on the bump map, go back to the Hypershade window and select the Blinn or Phong shader. In the Attribute Editor, adjust the Specular Roll Off and some of the other specular settings found under the heading Specular Shading. Figure 21 shows a rendering of the head after adjusting the various image maps and Attribute Editor settings.

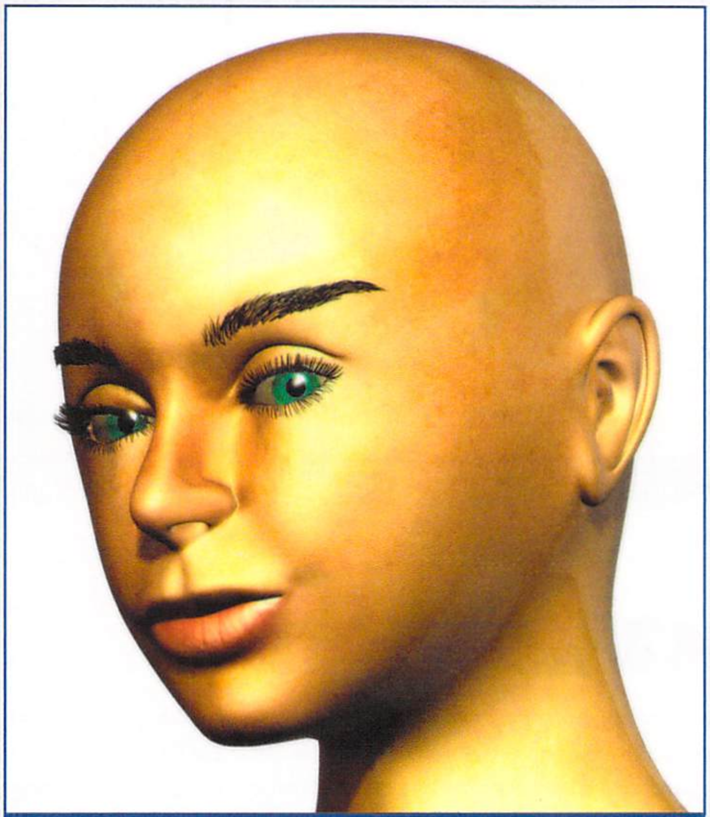


FIG. 21 THE RENDERED HEAD WITH ALL THE MAPS APPLIED TO IT

UV MAPPING AN ENTIRE BODY

After creating the UVs and textures for the face, continue mapping the rest of the body. The face UVs should only occupy a small section of the one unit square, leaving room for the body UVs.

In the UV Texture Editor window, right-click and select "Face." Select all the head UV faces. Switch to your perspective view and go to *Edit > Invert Selection.* Find the "Show" menu item in the perspective window. Select *Show > Isolate Select > View Selection.* This will hide the head and only display the body, making it easier to select parts of the anatomy.

Select the faces of the front of the body, excluding the feet and arms (Figure 22). Since the body is facing toward you in the front view, go to *Edit Polygons > Texture > Planar Mapping > Options.* Next to Mapping Direction, choose "Z-Axis" and click Project. This will place a Projection Manipulator in the perspective view. Your UV Texture Editor will show the flattened UV faces for the front of the body *(Figure 22).*

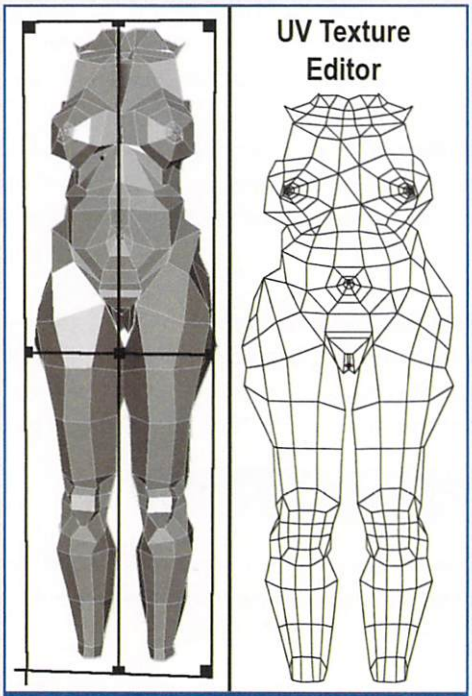


FIG. 22 PLANAR MAPPING THE FRONT OF THE BODY ON THE Z-AXIS AND THE RESULTING UV MAP

Right-click in the UV Texture Editor and select "UV." Drag a selection square around the front of the body UVs and move them out of the one unit square. If you used the Paint Selection tool to select the faces on the front of the body, you will need to drop this tool before you can select the UVs in the UV Texture Editor.

In your perspective window, select *Show > Isolate Select > View Selection*. The entire body and head are now visible again. In the UV Texture Editor, right-click and select "Face." Draw a selection around the front of the body and the head UVs. In your main window, go to *Edit > Invert Selection*. In the perspective view, go to *Show > Isolate Select > View Selection*. This will hide the head and front of the body faces. You can see that each time you create UVs for sections of the body it makes it easier to select faces to hide, because they can be seen clearly in the UV Texture Editor when you select your model. Be careful not to place sections on top of other ones.

Keep selecting parts of the anatomy, and use this technique of selecting faces in the UV Texture Editor and then hiding them so that it becomes easier to select the remaining sections for UV mapping. The rest of the body faces can be sectioned and UV mapped in the following manner. Each time you map a section, be sure to move it out of the way in the UV Texture Editor.

BACK OF THE BODY – Planar mapping on the Z-Axis.
TOP HALF OF THE ARMS – Planar on the Y-Axis.
BOTTOM HALF OF THE ARMS – Planar on the Y-Axis.
TOP HALF OF THE HANDS – Planar on the Y-Axis.
BOTTOM HALF OF THE HANDS – Planar on the Y-Axis.
TOP HALF OF THE FEET – Planar on the Y-Axis.
BOTTOM HALF OF THE FEET – Planar on the Y-Axis.

NOTE: If you bent the fingers into a more relaxed position, you can rotate your perspective view of the hand so that it is facing toward the camera. Go to *Edit Polygons > Texture > Planar Mapping > Options*. Next to *Mapping Direction* choose "Camera" and click Project.

In the UV Texture Editor, you should now have the various sections of the body UVs scattered around the one unit square. None should overlap another. Spend some time untangling overlapping faces. Parts that are not long enough can be scaled up so that they appear closer to the real proportions of an arm, leg, torso, and so on. Scale the various UVs down to fit into the one unit square. After you move all the parts into it, next to and under the head UVs your UV Texture view should show something similar to Figure 23.

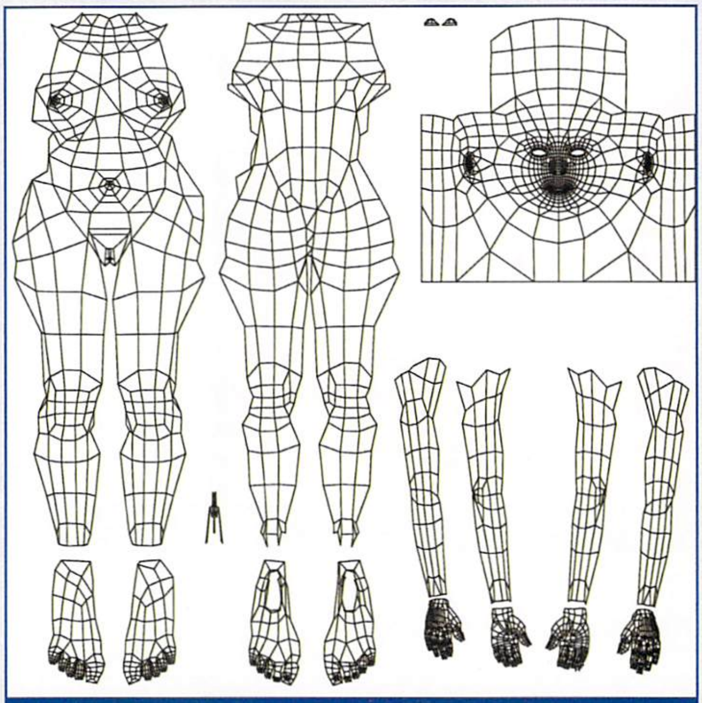
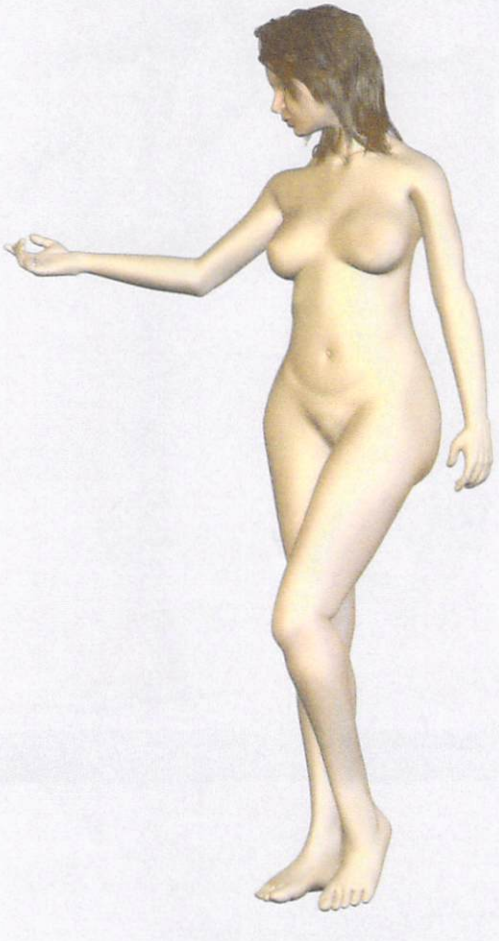


FIG. 23 THE UV SNAPSHOT OF THE ENTIRE BODY AND HEAD UVS.



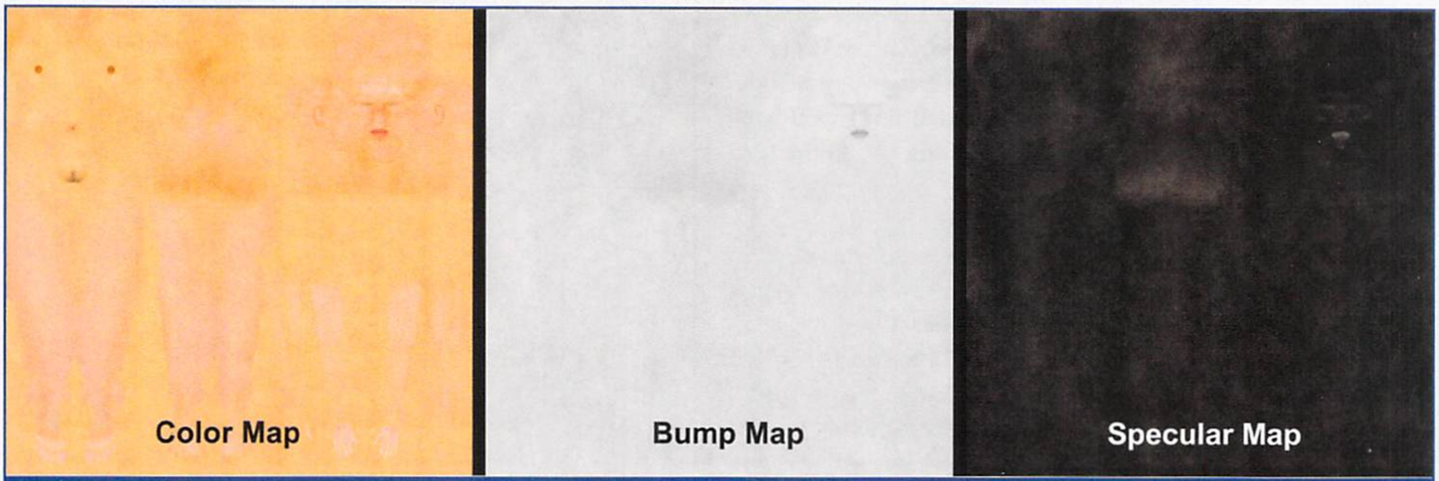


FIG. 24 THE THREE MAPS FOR THE ENTIRE BODY, INCLUDING THE HEAD

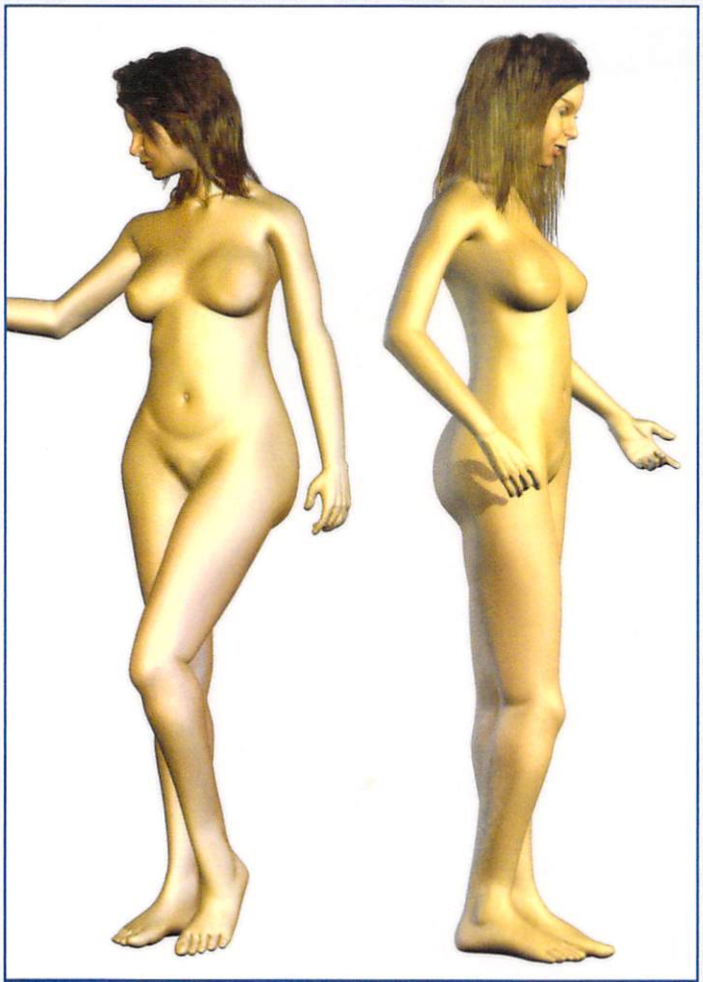


FIG. 25 THE THREE MAPS APPLIED TO THE ENTIRE BODY.

Now you are ready to make a UV Snapshot. In the UV Texture Editor go to *Polygons > UV Snapshot...* For texturing the entire body, use the highest resolution possible. In Photoshop, make the image size at least twice as big. If you already have texture maps for the head, then scale your UV Snapshot in Photoshop to their approximate size. Make sure the color, bump, and specular maps match the scale of the lines seen in the UV Snapshot.

Continue painting the rest of the body textures using the UV Snapshot as your guide. When you're done, save the color, bump, and specular maps as separate files to import into Maya.

Figure 24 shows the three maps for the entire body and Figure 25 illustrates the maps applied to the body.

PETER RATNER IS A PROFESSOR OF 3D COMPUTER ANIMATION AT JAMES MADISON UNIVERSITY. HE IS THE FOUNDER AND HEAD OF THE FIRST COMPUTER ANIMATION PROGRAM IN VIRGINIA. HIS PAINTINGS, ANIMATIONS, AND COMPUTER GRAPHICS HAVE BEEN DISPLAYED IN NUMEROUS NATIONAL AND INTERNATIONAL JURIED EXHIBITIONS. HE IS THE AUTHOR OF *3-D HUMAN MODELING AND ANIMATION, 1ST* AND *2ND EDITIONS* (JOHN WILEY AND SONS) AND *MASTERING 3D ANIMATION, 1ST* AND *2ND EDITIONS* (ALLWORTH PRESS). HE LIVES IN PENN LAIRD, VIRGINIA.

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BY WILLIAM "PROTON" VAUGHAN

I STILL HAVE MY FEET ON THE GROUND... I JUST WEAR BETTER SHOES!

Reverse Foot Rig for LightWave [8]

I love working on character models! I also love posing and animating the characters, but until LightWave [8] introduced the new Bone tools, I always tried to avoid character rigging at any cost. The new Bone tools in [8] have sped up the rigging process and afforded me the time to experiment with new setups. I've always enjoyed animating characters with the reverse foot rig setups that I have seen online, in training tapes, and in books, but they were always a long process that involved adding many Null objects to the rig.

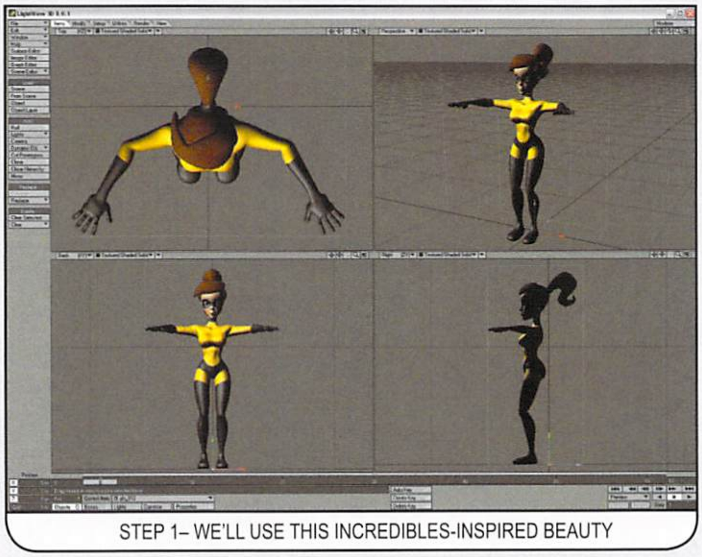
I set out to create an easy to set up reverse foot rig that worked without any Null objects, but gave the same functionality. I've worked with several talented animators to make sure that it's animator-friendly, so you should be able to be up and animating in minutes by following the steps below. Let's get started!

STEP 1:

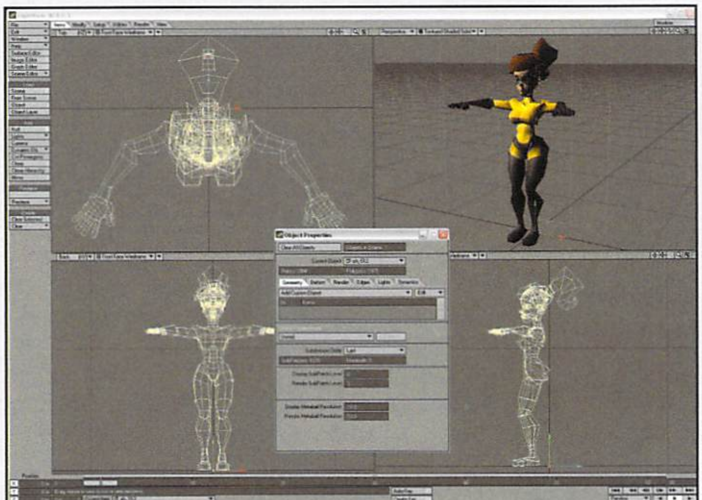
Load a Biped character into Layout and set up your workspace so that you can quickly create and adjust bones. I prefer to use the four-panel setup that mimics Modeler's default workspace. This is a throwback from when I created my rigs with Skelegons before [8].

When rigging, I like to turn the "Display Subpatch Level" down to "0" and change the top, back, and right viewports to "Front Face Wireframe." Turn "Bone X-ray" on in the perspective viewport to view the bones on top of the texture-shaded solid object.

NOTE:
I also like to hide the Camera and Light when I'm in the rigging process.



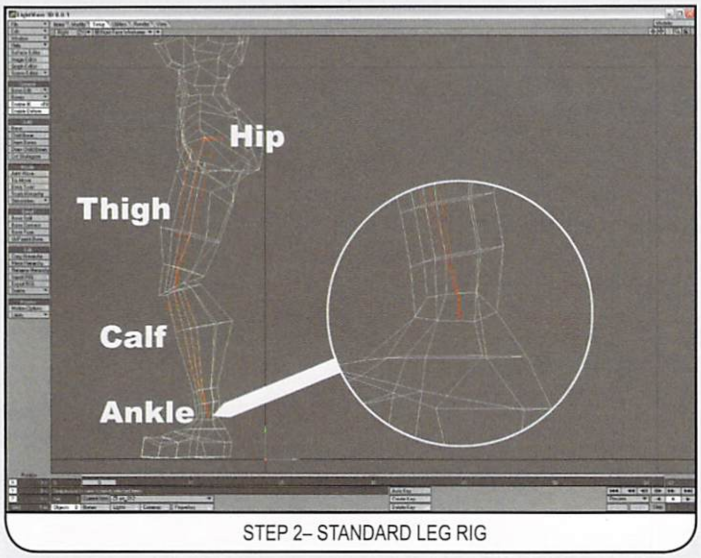
STEP 1– WE'LL USE THIS INCREDIBLES-INSPIRED BEAUTY



STEP 1– CHANGING THE DISPLAY TO FRONT FACE WIREFRAME GIVES YOU A CLEAR VIEW TO PLACE BONES

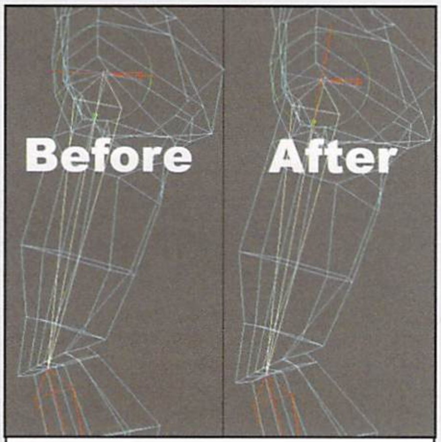
STEP 2:

Create four bones for the leg in the side view starting with the "Hip" bone and working your way down to the "Ankle" bone. After you have created the bones, rename them so that they are easy to select from a list.



STEP 2– STANDARD LEG RIG

Select the Thighbone and use *Record Pivot Rotation* (keyboard shortcut "P") on it to reset rotation settings.

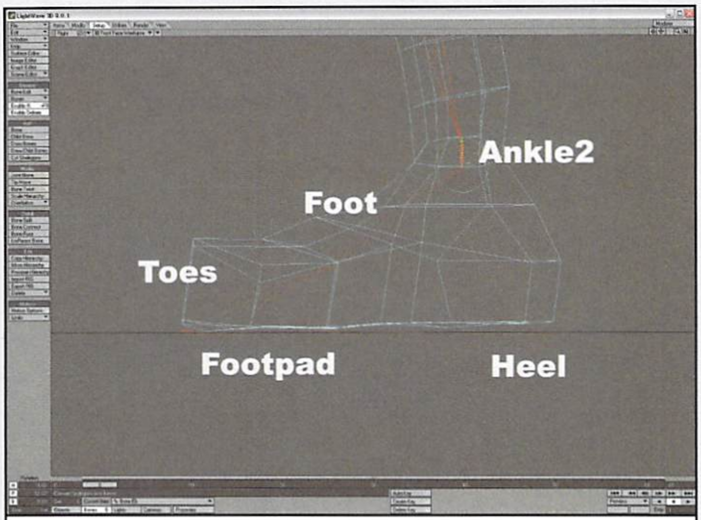


STEP 2– RECORD PIVOT ROTATION WILL FIX THE GIMBAL LOCK IN THE THIGH

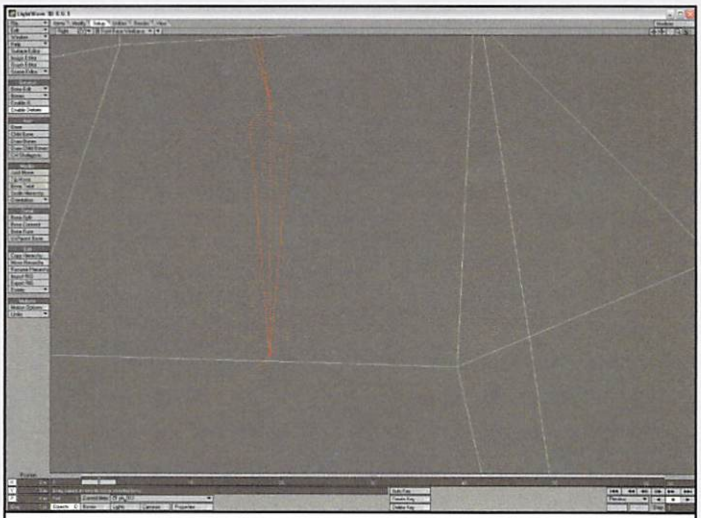
STEP 3:

Create five bones for the reverse foot rig, starting with the "Heel" bone and working your way up to the "Ankle2" bone. After you have created the bones, rename them so that they are easy to select from a list.

Your two anklebones should line up tip to base. Use Joint Move and Tip Move to make any last minute adjustments.



STEP 3– : THE PLACEMENT OF THE BONES IS THE KEY TO THE REVERSE FOOT RIG

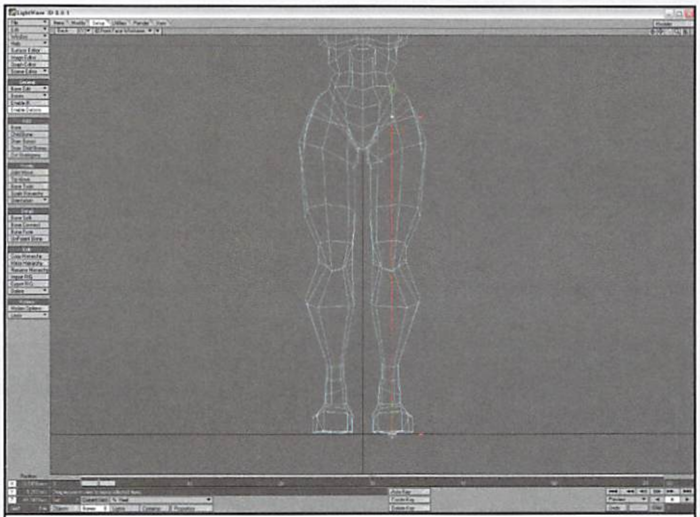


STEP 3– : CLOSE UP VIEW OF THE TWO ANKLEBONES

STEP 4:

Select the "Hip" bone and the "Heel" bone and move them into place in the Back viewport. Create a keyframe and rest the bones (Keyboard shortcut "r") in their new positions.

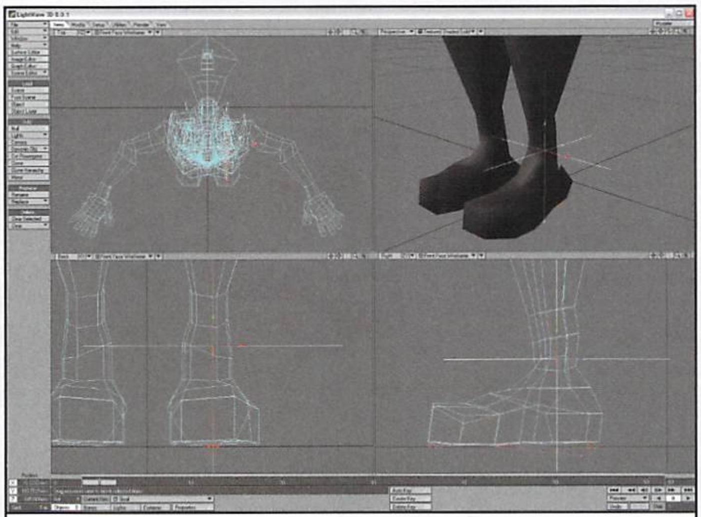
Note: Make sure all bones are off.



STEP 4– LINE UP ALL BONES IN THE BACK VIEWPORT

STEP 5:

Let's set up the leg so we can move on to the foot rig I promised. Add a Null object and name it "Goal." Don't worry; this is for the leg not the foot. Move the Null to the base of the "Ankle" bone and set a keyframe if Auto Key is turned off.

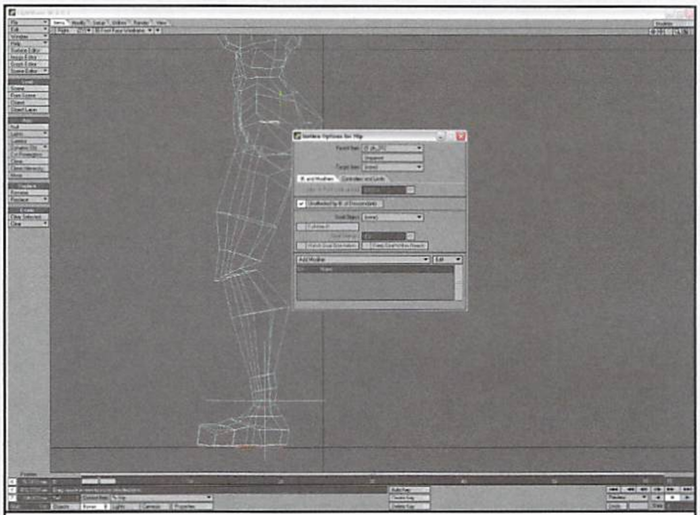


STEP 5– IT'S A GOOD IDEA TO ZOOM IN AND PLACE THE GOAL AS ACCURATELY AS POSSIBLE

STEP 6:

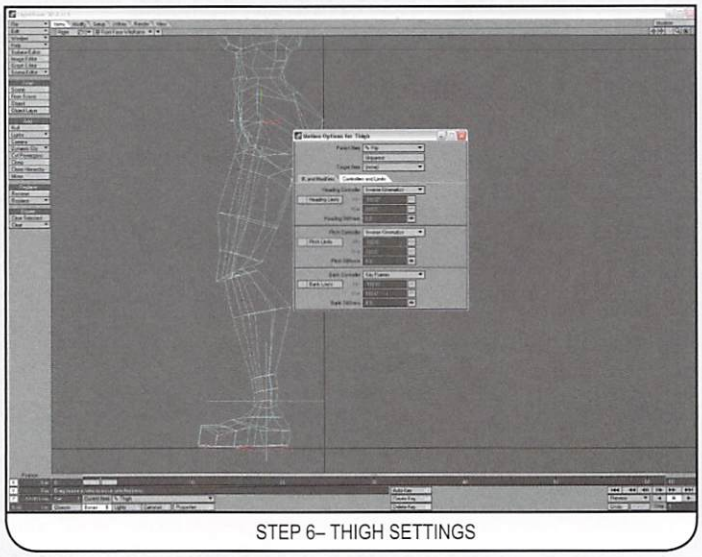
In the Motion Options panel, use the following settings.

Hip: Unaffected by IK of Descendents



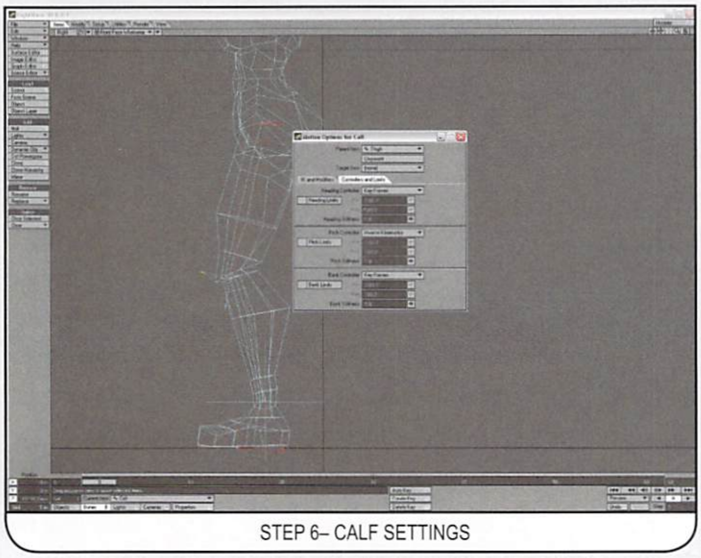
STEP 6– HIP SETTINGS

Thigh: Inverse Kinematics for the Heading and Pitch



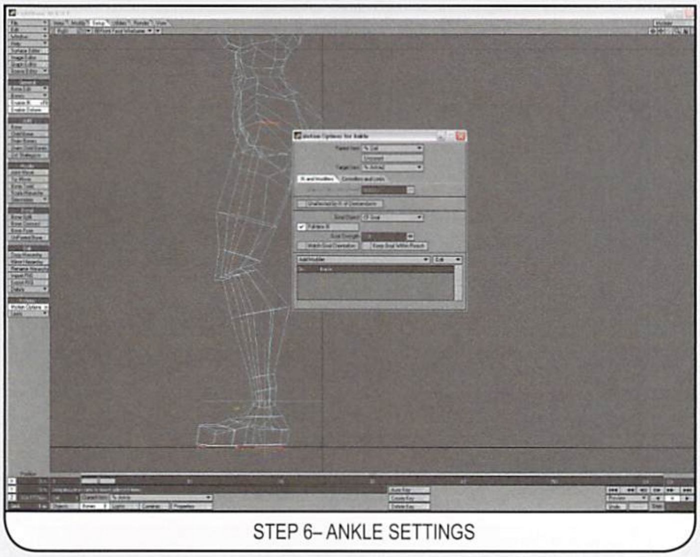
STEP 6– THIGH SETTINGS

Calf: Inverse Kinematics for the Pitch



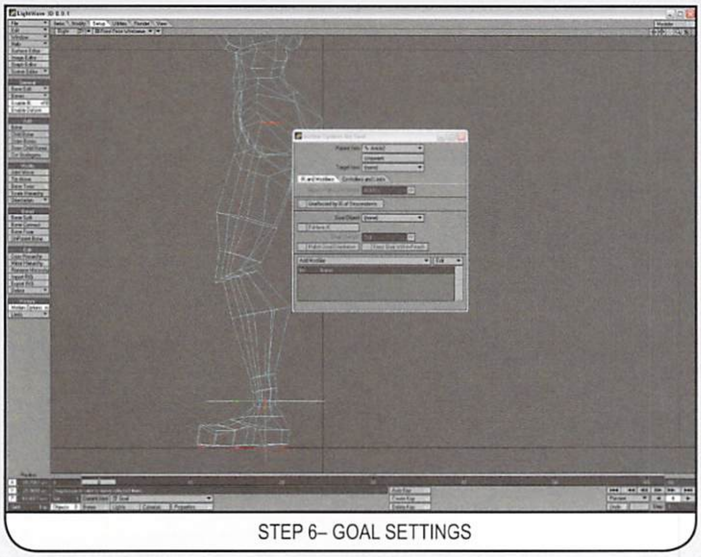
STEP 6– CALF SETTINGS

Ankle:Goal Object = "Goal" (Null), and turn on Full Time IK. Also set the Target Item to "Ankle2."

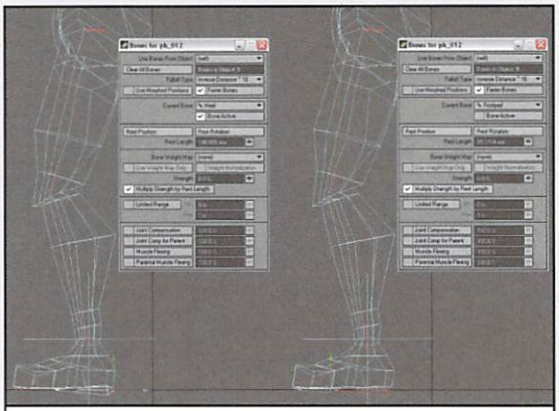


STEP 6– ANKLE SETTINGS

Goal: Parent the Goal to "Ankle2"



STEP 6– GOAL SETTINGS



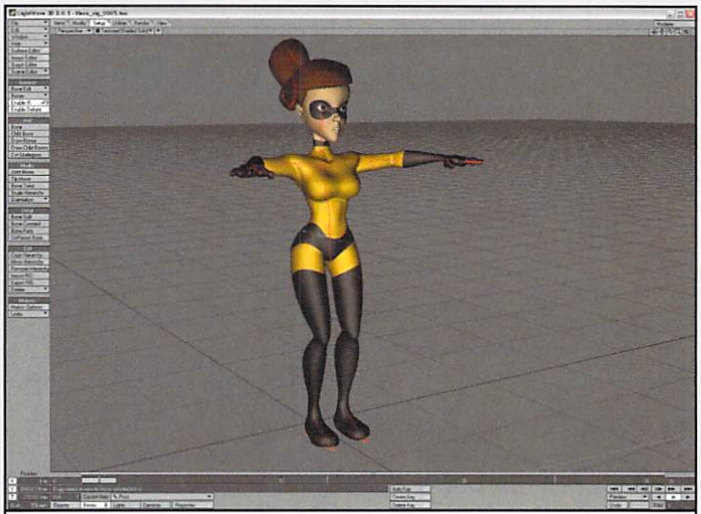
STEP 7– BONE STRENGTH SET TO '0' FOR HEEL AND FOOTPAD

STEP7:

Now for the easy reverse foot rig I promised. We have all the components we need; all that is left to do is set the Bone Strength to "0" for the Heel and Footpad bones. See, that wasn't so rough of a ride!

Turn on all Bones and make sure Enable IK is selected.

NOTE: Feel free to hide bones that you don't need to select. I hid the Ankle Bones, Thigh, and Calf.



STEP 7– BONES HIDDEN TO MAKE IT EASIER TO SELECT THE BONES NEEDED TO ANIMATE

Let's take a look at how to use the four bones that control the foot.

HEEL:

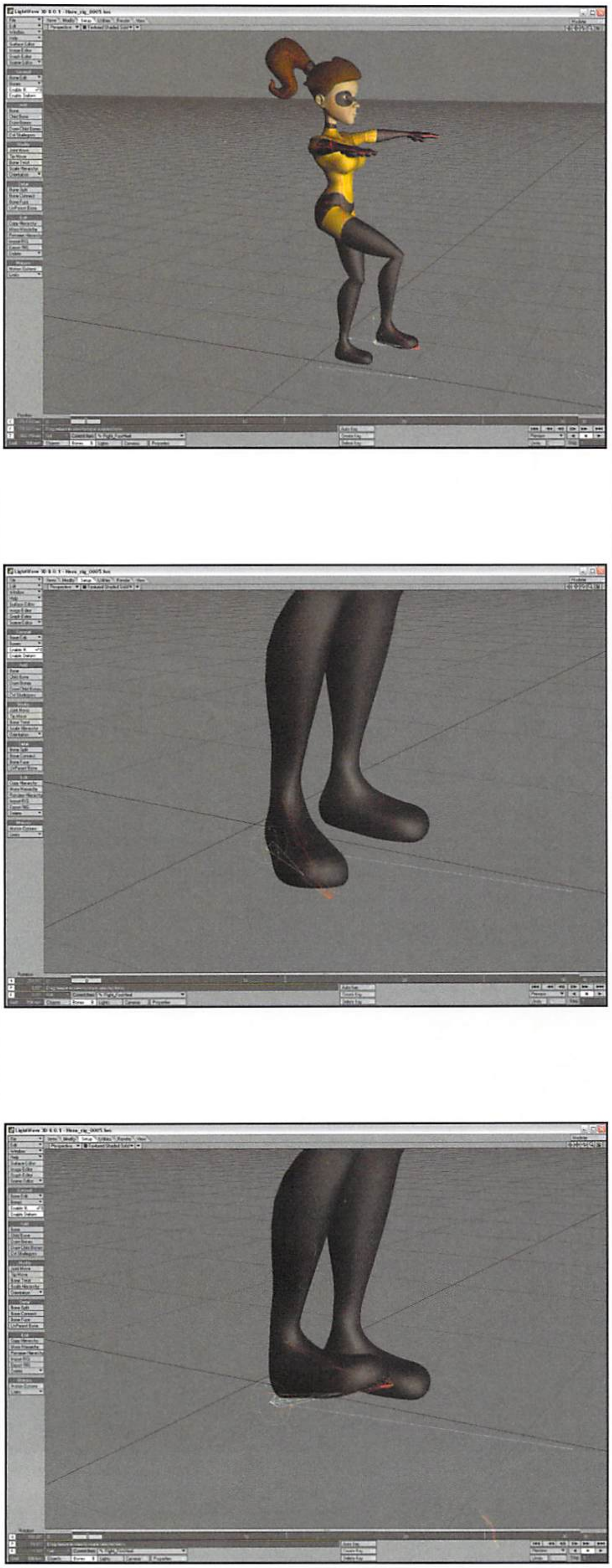
The Heel bone allows you to pick the foot up and the IK in the leg will kick into action. When in Rotate mode, you can rotate the entire foot rig at the base of the Heel.

FOOTPAD:

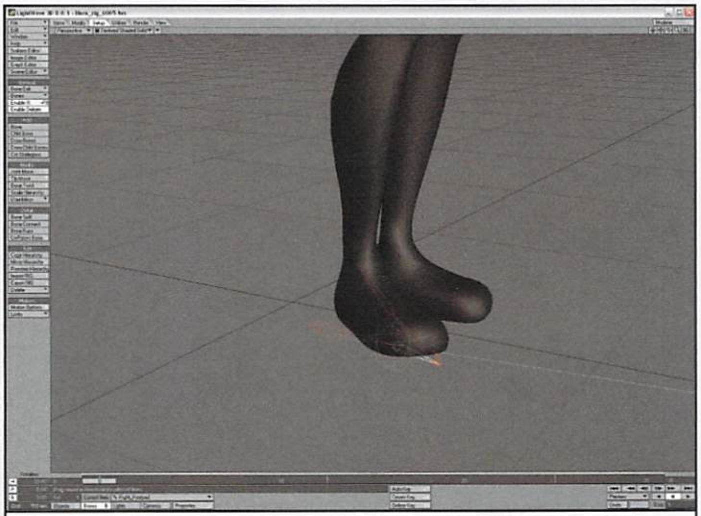
The footpad is used by rotating the Heading and is perfect for stomping out a cigarette (Quit smoking – it'll kill you) or making a turn in a military march.

TOES:

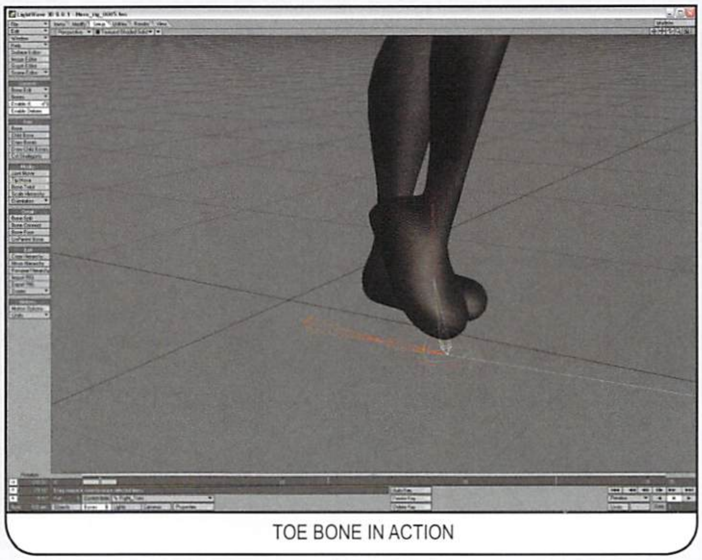
Rotating the Toe bone will allow your character to balance on the tip of the toes as well as swivel at the tip of the toes.



THE THREE IMAGES ABOVE ILLUSTRATE THE HEEL BONE IN ACTION



FOOTPAD BONE IN ACTION

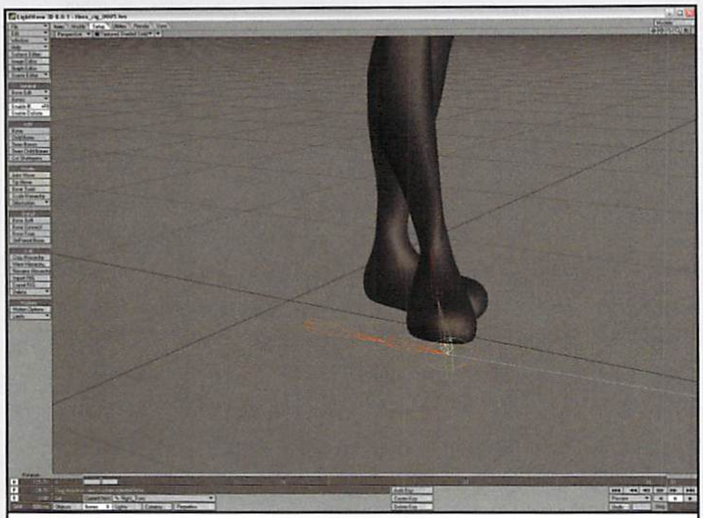


TOE BONE IN ACTION

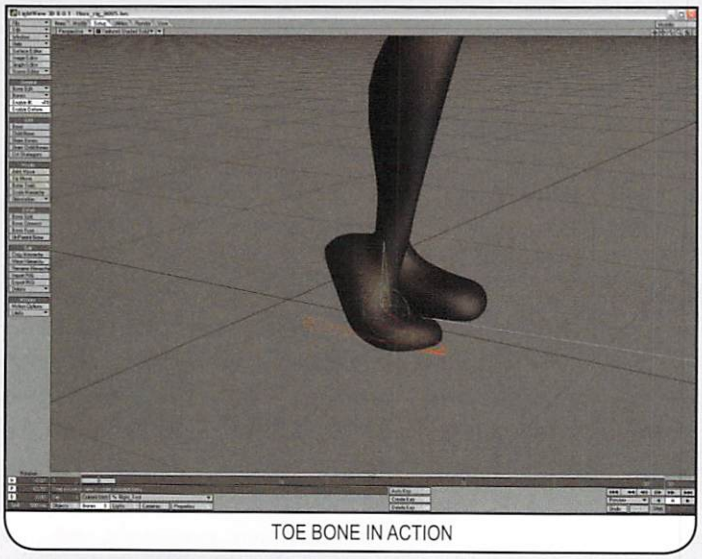
FOOT:

Rotating in the Pitch will bend the foot at the base of the toes.

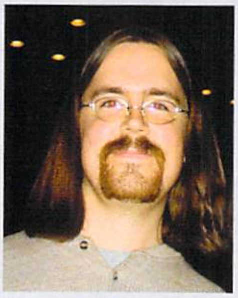
So there you have it. After you have set this rig up a few times you should be able to add it to a character from scratch in just a few minutes. Take advantage of the priceless Mirror Hierarchy tool in [8] to duplicate this leg and foot setup to the opposite leg. I hope that you have found a new option for setting up a reverse foot, and I would like to encourage you to experiment with different setups and find one that works for you. Good luck, and happy animating.



TOE BONE IN ACTION



TOE BONE IN ACTION

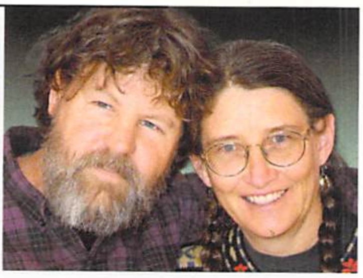


WILLIAM "PROTON" VAUGHAN IS A RECIPIENT OF SEVERAL NEW MEDIA ADDY AWARDS, WILLIAM HAS AN EXTENSIVE BACKGROUND IN CREATIVE 3D FOR PRINT, WEB, MULTIMEDIA, GAMES AND BROADCAST. DURING THE LAST 10 YEARS, HE HAS DELIVERED AWARD-WINNING WORK FOR CLIENTS SUCH AS COMPAQ, NEW LINE CINEMA AND HALLIBURTON. WILLIAM HAS ALSO TRAINED ARTISTS AT SEVERAL STUDIOS AND SCHOOLS AROUND THE WORLD AND CONTRIBUTED TO SIX LIGHTWAVE 3D BOOKS THROUGHOUT 2003 AND 2004.

IN 2002, VAUGHAN JOINED NEWTEK'S MARKETING TEAM AS THE LIGHTWAVE 3D EVANGELIST, WORKING CLOSELY WITH THE LIGHTWAVE DEVELOPMENT TEAM, KEY ACCOUNTS, AND THE GROWING NUMBER OF END USERS TO ENHANCE LIGHTWAVE'S FEATURES SET.

WILLIAM IS DIRECTOR OF INDUSTRY RELATIONS AND INSTRUCTOR OF THE DAVE SCHOOL 'S UPCOMING FINAL PROJECT. WILLIAM'S FOCUS IS ON CONTINUOUSLY IMPROVING THE QUALITY OF EDUCATION AT THE DAVE SCHOOL, WHILE FURTHER ESTABLISHING THE SCHOOL'S PRESENCE IN THE INDUSTRY.

MY COMPUTER ISN'T FAST ENOUGH



BY BRAD CARVEY

Imagine a new computer, 1000 times faster than any currently available home computer, with 1000 Gbytes of memory, a 3000 Ghz CPU, and a 2,000 terabyte hard drive (1 terabyte = 1000 Gbyte). Sounds pretty good, especially if you are rendering long, complex 3D animations. However, compared to the first personal computers, today's computers are 1000 times faster.

The first personal computers that I used were ones that I designed and built myself. I had to write both the operating systems and the applications. All programming was done by entering individual numbers, one at a time, into the computer's 512 bytes of memory. My first commercial PC was a Sinclair ZX-80 that I assembled from a kit for $99. This computer came with a whopping 1 or 2 k of ram, and if you needed it, a 16 Kbyte ram module was available. The module was bigger than a pack of cards and cost almost as much as the computer. At the time, more of Timex's version of the Sinclair ZX-80 were sold than Apple and IBM computers combined. Next came the 16-bit computers, like the Commodore 64, which could address 64 Kbytes of ram.

The first computer I used to do 3D animations was the Amiga 2000, with a 68020 processor running at 28 Mhz. It would take a mere hour to render a small shaded red ball with a specular highlight.

However, things have changed. My current computers have 2 Gbytes of memory, which is about 1000 times more than the Amiga 2000, 40,000 times more than the Commodore 64, 125,000 times more than the Sinclair, and an incredible 4 million times more than my first hand-built computers,

So your own personal computer is probably sounding pretty good right now. After all, it is many times faster than a Cray-1, which was over a million dollars and required full time engineers to keep it operating. The reality is, though, that it's not nearly fast enough. Even when personal computers are 1000 times faster, they will still be too slow for computer artists.

A few years ago, working with video resolution was difficult and time consuming. Film was out of the question. Today, it is easier for computer artists to work with film resolution shots than it was to work with video shots back then, but major studios still figure a one-hour-per-frame rendering time as acceptable. That has not changed much, but the complexity of the shots has changed. Imagine rendering 100,000 frames at 2048 x 1556 with high quality radiosity. Film is typically rendered to the Cineon format, which is about 12 Mbytes per image. For an hour of 3D animation, you would need 1,000,000,000,000 bytes of storage. That would require only four 250 Gbyte hard drives. That's not too bad. But on a single computer, taking an hour to render a frame, it would take 10 years for 60 minutes of animation. If you used 10 computers, then you would only need one year, and with 100 computers it would only require a little more than a month. If you were thinking computers were fast, by now you may be thinking that they are way too slow.

Typically, film shots are rendered at 2048 x 1556, known as 2k Full aperture. This is the size of the digitized film typically used today for adding visual effects or rendering animations. Some animations are rendered at 1k (1024 x 778) and then processed to double the resolution to 2k before conversion to film. With a dual processor and 4 Gbytes of memory, it's not too difficult to do compositing with film even when its digitized at 4K resolution (48 Mbytes per frame), which is occasionally used on high-end projects. IMAX film is about eight times the size of the 35 mm film that is used for the majority of feature films. I have not worked with IMAX film, but I assume that it would be 96 Mbytes per frame. The current top of the line multiprocessor computer can handle film compositing and animation reasonably well.

Just when computers were starting tocatch up with my typical film work, a job came along, one that was too much for even the best workstations available today. A client requested content for a video wall. The wall has 48 projectors. Each one was rear-projected onto a special glass wall. The wall's resolution (pixel dimension) was a daunting 15,360 x 4096 pixels. That's 63 Mbytes per image, or about 755 Mbytes per second. The resulting animation was around three minutes long and required delivery on an 80 Gbyte hard drive.

Part of the job was to determine what tools would be useful for scientists to enable them to display their content on the wall. Most of the software I tried did not work with the large image sequences. After Effects and Digital Fusion would usually start rendering a composite, but would freeze up or quit after a few frames were finished. None of the editing software I tried would handle the large frames.

It was like the old days. My computer was the equivalent of the Amiga and took hours to do even simple tasks. The fancy compositing and editing programs did not work and I was required to be creative to get the tools I had to complete the job. I was able to do a lot of image manipulation in Photoshop without problems. LightWave was used for everything else. It was a pain to use LightWave for editing, compositing, color correction, and everything else that needed to be done, but it was the only way. This job brought my computer to its knees and reminded me of how it used to be, and how it always will be.

BRAD AND ANDREA CARVEY HAVE BEEN DOING COMPUTER ANIMATIONS FOR A LONG TIME. IN 1969 BRAD USED AN ANALOG COMPUTER, WHICH WAS THE SIZE OF A CAR, TO PRODUCE HIS FIRST COMPUTER ANIMATION. ANDREA, AN ARCHEOLOGIST, PREFERS TO DO SCIENTIFIC ANIMATIONS; HER CREDITS INCLUDE PROGRAMS LIKE DISCOVERY CHANNEL'S *UNDERSTANDING CARS.* BRAD IS AN ELECTRICAL ENGINEER AND AN EMMY AWARD-WINNING MEMBER OF THE VIDEO TOASTER DEVELOPMENT TEAM. HE PREFERS TO DO FEATURE FILM WORK. HIS CREDITS INCLUDE FILMS LIKE *MEN IN BLACK, STUART LITTLE, BLACK HAWK DOWN, KATE & LEOPOLD* AND *MASTER OF DISGUISE.*

DOSCH DESIGN

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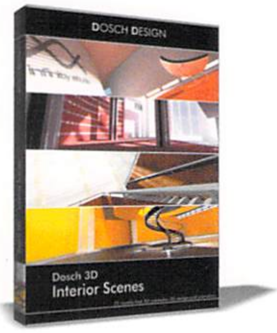
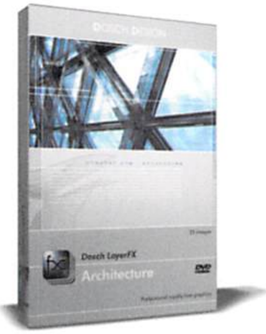
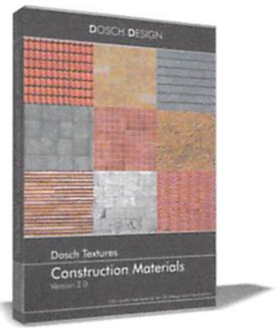


Dosch 3D: **Interior Scenes**



Dosch LayerFX: **Architecture**



Dosch Textures: **Construction Materials V2**

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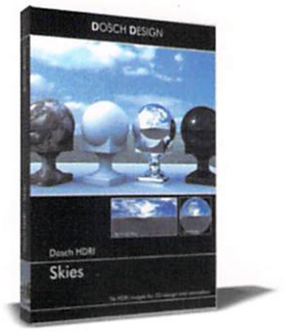

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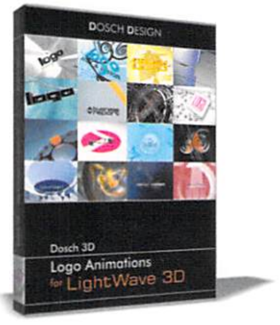
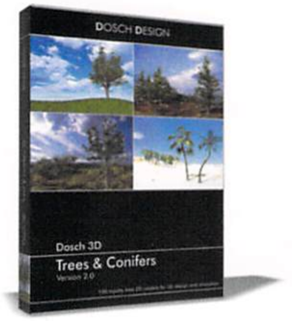


Dosch 3D: **Logo Animations for LightWave3D**

Dosch 3D: **Humans V2**



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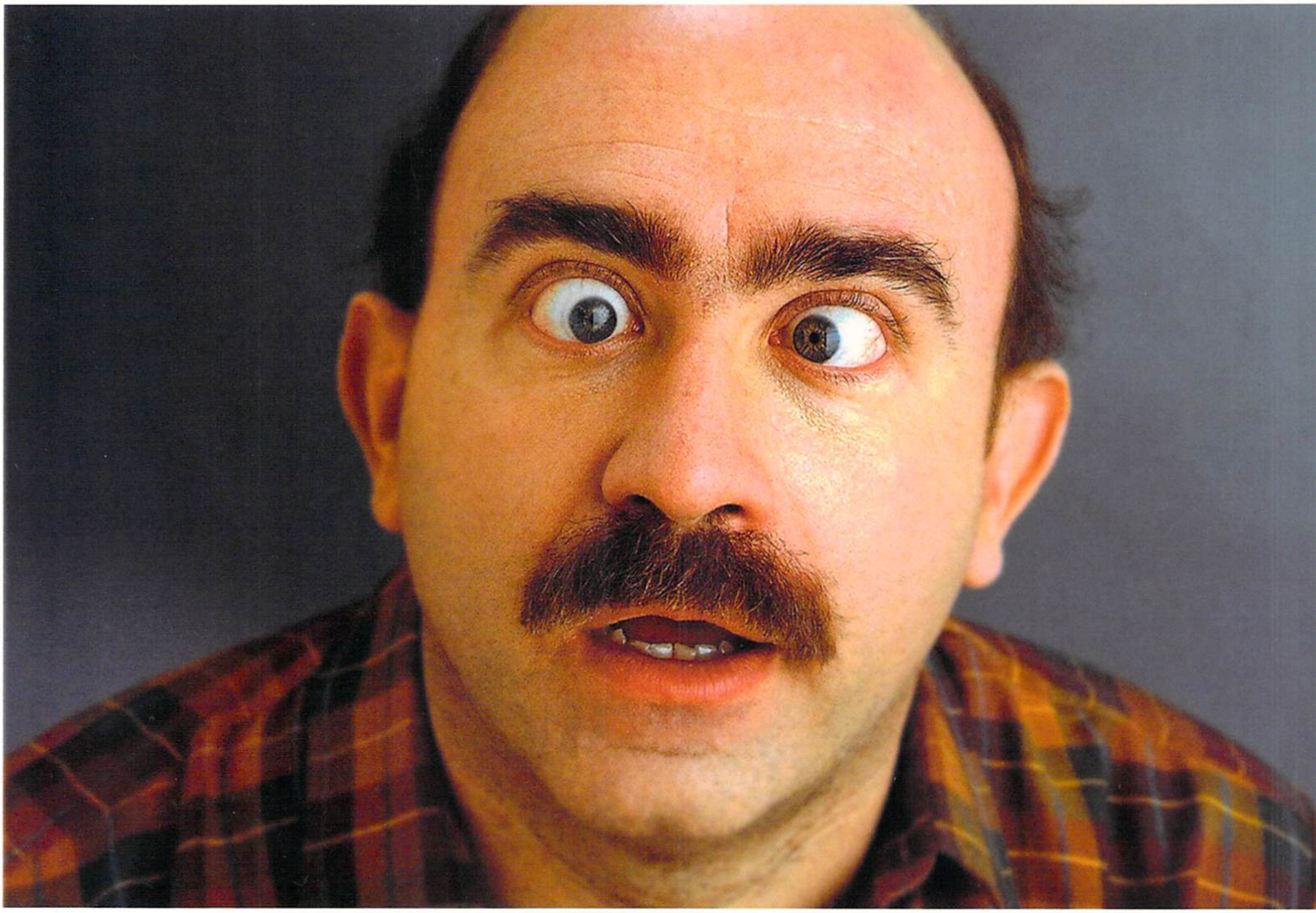

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